VPDES PERMIT FACT SHEET

This document gives pertinent information concerning the reissuance of the VPDES permit listed below. This permit is being processed as a minor, municipal permit. The effluent limitations contained in this permit will maintain the Water Quality Standards of 9 VAC 25-260 et seq. The discharge results from the operation of a publicly owned sewage treatment plant at a highway rest area. This permit action consists of updating the permit to reflect changes in the Water Quality Standards, Guidance Memos, and the VPDES Permit Manual. SIC Code: 4952.

1. **Facility Name:** VDOT Brunswick County Rest Area
Address: 1401 East Broad Street
Richmond, VA 23219

Location Interstate I-85 Northbound – Mile Marker 32
Brunswick County, Virginia

2. **Permit Number** VA0061379
Existing Permit Expiration Date: October 19, 2008

3. **Owner Contact**
Name: Mr. Jacob Porter
Title: Special Facilities Program Manager, Asset Management Divisions
Telephone No: 804-662-9615

4. **Application Complete Date:** June 5, 2008
Permit Drafted By: Jaime Bauer, Piedmont Regional Office
Reviewed By: Tamira Cohen **Date:** April 10, 2008
Reviewed By: Ray Jenkins **Date:** June 11, 2008

Public Notice Dates: First Publication Date: July 30, 2008
Second Publication Date: August 6, 2008
Public Comment Period: July 30, 2008 to August 29, 2008

5. **SCC Certification Verification as required by Section 62.1-44.15:3 of the State Water Control Law:** Applies only to privately owned treatment works. The facility is owned by a state agency.

6. **Financial Assurance/Closure as required by 9 VAC 25-650-10:** Applies only to privately owned treatment works and does not apply to design flows greater than 40,000 gallon per day. While the design is less than 40, 000 gallons per day, the facility is owned by a state agency and therefore financial assurance is not required.

7. **Receiving Stream Name:** Unnamed Tributary of Sturgeon Creek
Basin: Chowan and Dismal Swamp Basin
Subbasin: Chowan River
Section: 2b
Class: III
Special Standards: None
River Mile: 5AXBM002.06

7-Day, 10-Year Low Flows:	0.006 MGD	0.010 cfs
1-Day, 10-Year Low Flows:	0.003 MGD	0.005 cfs
30-Day, 5-Year Low Flows:	0.011 MGD	0.017 cfs
30-Day, 10-Year Low Flows:	0.009 MGD	0.013 cfs
7-Day, 10-Year High Flows:	0.029 MGD	0.045 cfs

1-Day, 10-Year High Flows:	0.021 MGD	0.033	cfs
30-Day, 10-Year High Flows:	0.042 MGD	0.065	cfs
1-Q30 Flows	0.002 MGD	0.003	cfs
Harmonic Mean Flow:	0.028 MGD	0.043	cfs
Tidal:	No		
On 303(d) List:	No		

See Flow Frequency Memo dated January 23, 2008 revised March 18, 2008(Attachment 1)

8. **Operator License Requirements**: Class IV
(9 VAC 25-790-300)

9. **Reliability Class**: Class II
(9 VAC 25-790-70)

10. **Permit Characterization:**

___ Private ___ Federal __X__ State __X__ POTW ___ PVOTW

___ Possible Interstate Effect _____ Interim Limits in Other Document

11. **Table 1: Wastewater Flow and Treatment**

Outfall Number	Discharge Source	Treatment	Flow Design Capacity
001	Interstate Restroom Operation WWTP	Comminutor, screen, extended aeration, clarification, polishing pond, chlorine disinfection, and post aeration.	0.036 MGD

(See Attachment 2 for facility diagram)

12. **Sewage Sludge Use or Disposal:**
Sludge is pumped and hauled by Long and Associates to the Beaverdam Creek Wastewater Pump Station in Hanover County. It is then pumped to the Henrico County Water Reclamation Facility in Henrico County where it is treated.

13. **Discharge Location Description**:
The facility discharges to an unnamed tributary of Sturgeon Creek. See Attachment 3 for the Lawrenceville Topo Map, 041D.

14. **Material Storage**:
Chlorination and dechlorination tablets are stored under roof.

15. **Ambient Water Quality Information**:
Ambient water quality data is compiled from Sturegon Creek at station 5ASTG005.96 near the Route 712 bridge approximately 5 miles downstream from the discharge point. The monitoring station was selected upon the advice of J. Palmore, Senior Environmental Planner, DEQ Piedmont Regional Office. See Attachment 5B for monitoring data.

16. **Antidegradation Review & Comments:** **Tier 1** ___ **Tier 2** __X__ **Tier 3** ___
The State Water Control Board's Water Quality Standards includes an antidegradation policy (9 VAC 25-260-30). All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality

standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

After April 27, 1994 but prior to April 20, 1998, the effluent discharge location was moved from an intermittent stream to a perennial stream according to notes regarding the location of the discharge at this facility from water quality planning staff person Paul Herman. However, during the 2003 permit cycle documentation by the permit writer indicated a discharge to a dry ditch and all stream flow information was assumed to be 0 MGD and designated as a Tier 1. There is no associated flow frequency documentation included with the permit fact sheet. Planning, also, does not have record that flow frequency analysis was performed for the 2003 permit re-issuance. A site visit was performed on May 6, 2008 by the permit writer and planning staff which confirmed that the discharge at the facility is to a perennial stream.

The antidegradation review begins with a Tier determination. The discharge is to an unnamed tributary to Sturgeon Creek. The unnamed tributary was not assessed during the 2006 or draft 2008 305(b)/303(d) Water Quality Assessment and therefore determined to be a Tier 2 water body. The initial permit issuance also designated the receiving stream as a Tier 2. Antidegradation restrictions are applied in the wasteload allocation analysis for toxic parameters.

The 2003-2008 permit required the permittee to conduct in-stream monitoring for an unnamed tributary of Sturgeon Creek to evaluate the effect of the facility's discharge. Despite occasional violations of the dissolved oxygen standard, planning staff reviewed monitoring data and determined that the facility has not caused "an obvious negative impact" on the unnamed tributary during the study period supporting the Tier 2 designation. (See Attachment 8 for the Stream Monitoring Data Analysis – Sturgeon Creek, UT)

17. **Site Inspection**: May 6, 2008. See Attachment 7.

18. **Effluent Screening & Limitation Development**:

EFFLUENT CHARACTERISTICS	BASIS FOR LIMITS	DISCHARGE LIMITATIONS					
		MONTHLY AVERAGE		WEEKLY AVERAGE		MIN	MAX
Flow (MGD)	NA	NL		NA		NA	NL
pH (standard units)	1,2	NA		NA		6.0	9.0
BOD_5	1	20 mg/L	2700 gms/d	30 mg/L	4100 gms/d	NA	NA
TSS	2	30 mg/L	4100 gms/d	45 mg/L	6100 gms/d	NA	NA
TRC	1	0.0023 mg/L		0.0029 mg/L		NA	NA
Dissolved Oxygen	1	NA		NA		6.5 mg/L	NA
Ammonia as N (Apr – Sept)	1	1.2 mg/L		1.2 mg/L		NA	NA
Ammonia as N (Oct – Mar)	1	2.3 mg/L		2.3 mg/L		NA	NA

Basis for Limits

Permit limitation development for toxic pollutants began with obtaining flow frequency and stream data from the water planning group. The flow frequency data was then entered into MIX.exe to determine the proper mix to be used in the MSTRANTI spreadsheet. Effluent data were compiled from DMRs submitted regularly by the facility. The mixing ratios, effluent data, stream data, and flow frequencies were entered into the MSTRANTI spreadsheet to calculate Wasteload Allocations which were then entered into STATS.exe. See Attachment 5 for permit limitation development documents.

1. Water Quality-Based Limits:

pH: A pH range of 6.0 – 9.0 Standard Units is assigned to all Class III waters per the Virginia Water Quality Standards, 9 VAC 25-260-50.

Biological Oxygen Demand (BOD_5): Based on the October 17, 1975 Memorandum on WLA for Interstate 85 Rest Stop – Brunswick County. See Attachment 4. The BOD_5 effluent limit as specified in the secondary treatment standard in 40 CFR 133.102 is 30 mg/L and 45 mg/L monthly and weekly average, respectively. The BOD_5 limit is more stringent than the federal secondary standards due to water quality concerns.

Total Residual Chlorine (TRC): A limitation evaluation was conducted for TRC. The chronic and acute WLAs were calculated using the MSTRANTI Excel Spreadsheet. Acute and chronic WLA for TRC were calculated as 0.0051 mg/L and 0.0032 mg/L, respectively. Following the procedures in GM 00-2011, since the WLAa was less than 4.0 mg/L, the actual WLA were entered into STATS.exe to determine the need for a permit limitation and calculate the limitation. A quantification level of 0.10 mg/L and a data point of 20 mg/L were used as recommended by the VPDES permit manual. The evaluation produced recommended limitations of 0.0023 mg/L for average monthly and 0.0029 mg/L for average weekly in order to protect water quality (See Attachment 5F). No compliance schedule is being included because the facility is already demonstrating compliance with the new TRC limits as per the requirements of the Compliance Reporting Special Condition.

Dissolved Oxygen (DO): Based on the October 17, 1975 Memorandum on WLA for Interstate 85 Rest Stop – Brunswick County. See Attachment 4. The minimum DO criteria for class III waters in the Virginia Water Quality Standards (WQS) is 4.0 mg/L.

Ammonia: In the current permit (2003 cycle) the permittee is given seasonally tiered limitations based on temperature because of problems meeting ammonia limitations in winter months. The monthly in-stream monitoring data submitted by the permittee were used to define the seasonal tiers for the limitations. (Attachment 9) Data were averaged for each month and the annual average temperature calculated. The monthly averages were plotted on a chart along with the annual average temperature to determine seasonality. Based on this chart it was determined that the winter months for the facility's location are October through March.

The wasteload allocations for ammonia for annual and winter were calculated using the MSTRANTI Excel spreadsheet. The effluent average summer temperature provided by the permittee on the Form 2A permit application was used to calculate a WLA for ammonia for the summer season. The permittee also provided an average winter effluent temperature; however, that temperature only included 31 data points all from the month of January. Because the average winter temperature did not include any other months defined as part of the winter season, staff did not use this temperature for calculating the winter WLA for ammonia. Instead, a best professional judgment was made to use a default winter temperature of 14°C that is often used for modeling.

The WLAs were entered in to the STATS.exe computer application to determine the need for permit limitations and calculate the limitations. Annual acute and chronic WLAs of 3.2 mg/L and 0.65 mg/L, respectively, were entered into STATS.exe with a quantification level of 0.2 mg/L. Under winter conditions, the acute and chronic WLA's are 3.2 mg/L and 1.3 mg/L, respectively. Following procedures established in Virginia DEQ Guidance Memo 00-2011, a single datum point of 9.0 mg/L

was input into the program in each evaluation. The evaluation resulted in a recommended annual limitation of 1.3 mg/L averaged weekly and monthly and winter limitation of 2.6 mg/L averaged monthly and weekly. However, the previous permit limitations for ammonia will be carried forward in this permit reissuance due to anti-backsliding. (See Attachment 5F)

2. Federal Effluent Guidelines (Technology Based Limits)

Total Suspended Solids (TSS): Municipal facilities are required to meet secondary treatment requirements. As promulgated in 40 CFR 133, secondary treatment for TSS will meet limits of 30 mg/L for a monthly average and 45 mg/L for a weekly average.

pH: The secondary treatment standards as promulgated in 40 CFR 133.102 establish a pH range of 6.0 to 9.0 S.U.

19. **Basis for Sludge Use & Disposal Requirements:**
A sludge management plan for the pump and haul disposal of sludge from this facility is required according to 9 VAC 25-31-100 P. Sludge from the rest area is pumped and hauled by Long and Associates to the Beaverdam Creek Wastewater Pump Station in Hanover County. It is then pumped to the Henrico County Water Reclamation Facility in Henrico County where it is treated.

20. **Antibacksliding Statement**:
9VAC 25-31-220.L and DEQ Guidance Memo 00-2011, do not allow re-issued permits to contain a less stringent water-quality based effluent limitation, unless under certain specified exceptions. One such exception is when information becomes available, which was not available at the time of re-issuing the previous permit cycle (other than revised regulations, guidance, or test methods), that would have justified the application of a less stringent effluent limitation at the time of (previous) permit issuance.

During the 2003-2008 permit cycle, the facility was required to collect in-stream monitoring data. This data was used in Attachment 9 to define the months for winter and summer for the establishment of seasonal tiers for ammonia. The 2003-2008 permit included the winter and summer months as December to April and May to November, respectively. Review of the water temperature data from the in-stream monitoring indicated that the actual winter and summer seasons are October to March and April to September, respectively.

With the shift in the definition of the seasonal months in the permit, it may appear that backsliding is occurring in the months of October and November when the ammonia limitation is changing from 1.2 mg/L to 2.3 mg/L. Because the in-stream monitoring data required by the 2003-2008 permit provided water temperature data that was not previously available to define the seasons, application of a less stringent limitation is justified.

All limits are at least as stringent as in the previous permit.

21. **Compliance Schedules:**
Rationale: The VPDES Permit Regulation at 9 VAC 25-31-250 allows for schedules of compliance, when appropriate, which will lead to compliance with the Clean Water Act, the State Water Control Law and regulations promulgated under them.

Analysis of effluent data indicated the need to establish more stringent effluent limitations for TRC. In most circumstances when a more restrictive effluent limitation is established, it is appropriate to allow a period of time for the permittee to achieve compliance. However, the facility is already demonstrating compliance with the new permit limitation in accordance with the Compliance Reporting Special Condition. Consequently, a compliance schedule for these parameters was not given.

22. **Special Conditions:**

B. Additional Effluent Limitations and Monitoring Requirements
Rationale: Required by VA Water Quality Standards, 9 VAC 25-260-170 Bacteria: other waters. Also, 40 CFR 122.41(e) requires the permittee, at all times, to properly operate and maintain all facilities and systems of treatment in order to comply with the permit. This ensures proper operation of chlorination equipment to maintain adequate disinfection

C.1. 95% Capacity Reopener
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-200 B 2 for all POTW and PVOTW permits

C.2. CTC, CTO Requirement
Rationale: Required by Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790.

C.3. O&M Manual Requirement
Rationale: Required by Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790; VPDES Permit Regulation, 9 VAC 25-31-190 E.

C.4. Materials Handling/Storage
Rationale: 9 VAC 25-31-50 A. prohibits the discharge of any wastes into State waters unless authorized by permit. Code of Virginia Section §62.1-44.16 and §62.1-44.17 authorizes the Board to regulate the discharge of industrial waste or other waste.

C.5. Licensed Operator Requirement
Rationale: The VPDES Permit Regulation, 9 VAC 25-31-200 C. and the Code of Virginia § 54.1-2300 et seq, Rules and Regulations for Waterworks and Wastewater Works Operators (18 VAC 160-20-10 et seq.), require licensure of operators.

C.6. Reliability Class
Rationale: Required by Sewage Collection and Treatment Regulations, 9 VAC 25-790 for all municipal facilities.

C.7. Sludge Reopener
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-220 C.4 for all permits issued to treatment works treating domestic sewage.

C.8. TMDL Reopener
Rationale: Section 303(d) of the Clean Water Act requires that total maximum daily loads (TMDLs) be developed for streams listed as impaired. This special condition is to allow the permit to be reopened if necessary to bring it into compliance with any applicable TMDL approved for the receiving stream. The re-opener recognizes that, according to section 402(o)(1) of the Clean Water Act, limits and/or conditions may be either more or less stringent than those contained in this permit. Specifically, they can be relaxed if they are the result of a TMDL, basin plan, or other wasteload allocation prepared under section 303 of the Act. This reopener is included in all permits.

C.9. Compliance Reporting
Rationale: Authorized by VPDES Permit Regulation, 9 VAC 25-31-190 J 4 and 220 I. This condition is necessary when pollutants are monitored by the permittee and a maximum level of quantification and/or a specific analytical method is required in order to assess compliance with a permit limit or to compare effluent quality with a numeric criterion. The condition also establishes protocols for calculation of reported values.

C.10. Sludge Use and Disposal
Rationale: VPDES Permit Regulation, 9 VAC 25-31-100 P; 220 B 2; and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on sludge use and disposal practices and to meet specified standards for sludge use and disposal.

C.11. Effluent Monitoring Frequencies
Rationale: Permittees are granted a reduction in monitoring frequency based on a history of permit compliance. To remain eligible for the reduction, the permittee should not have violations related to the effluent limitations for which reduced frequencies were granted. If the permittees fail to maintain the previous level of performance, the baseline monitoring frequencies should be reinstated for those parameters that were previously granted a monitoring frequency reduction.

Part II, Conditions Applicable to All Permits
Rationale: VPDES Permit Regulation, 9 VAC 25-31-190 requires all VPDES permits to contain or specifically cite the conditions listed.

23. **Changes to the Permit:**

Permit Cover Page:	
Item	**RATIONALE**
Initial paragraph	Updated language to reflect current agency guidance that incorporates the permit application as part of the permit.
Section 2 Changed to 2b	Updated receiving stream section designation based on Water Quality Standards for the Chowan and Dismal Swamp River Basin.

Part I.A.

Outfall No.	**Parameter Changed**	**Monitoring Requirement Changed**		**Effluent Limits Changed**		**Reason for Change**	**Date**
		From	To	From	To		
001	TRC	-	-	0.0080 mg/L 0.0098 mg/L	0.0023 mg/L 0.0029 mg/L	Evaluation of TRC indicated a needed for a more stringent limitation to maintain water quality.	4/08
	BOD5	1/Month	1/6 months	-	-	This facility has maintained performance levels that, according to guidance, qualifies it for reductions in monitoring requirements for NH_3, BOD_5, and TSS.	6/08
	TSS	1/Month	1/Quarter	-	-		

FROM	**TO**	**RATIONALE**
Ammonia (May – Nov)	Ammonia (Apr-Sept)	The months for the ammonia limitations have been adjusted to match seasonality that appears in monitoring data submitted by the facility. See Attachment 9.
Ammonia	Ammonia	

(Dec – Apr)	(Oct-Mar)	
Footnote a.	Footnote (1)	Updated language to reflect current agency guidance.
Footnote b.	Footnote (3)	Added to reflect current agency guidance.
-	Footnote (2)	Added to reflect current agency guidance.
Part I.A.2	Part I.A.1.a	Renumbered.
Part I.A.3.	Part I.A.1.b	Renumbered.

Special Condition Changes:		
FROM	**TO**	**RATIONALE**
B.1.c	B.1.c	**TRC Limitations and Monitoring Requirements:** 0.6 mg/L changed to 0.60 mg/L to reflect significant digit guidance.
B.1.d	B. 1.d. and B.2	Renumbered.
B.2	Removed	**Bacterial Limitations and Monitoring Requirements:** Facility performed bacterial (E. coli) study establishing chlorination as a surrogate for bacteria monitoring and submitted data to DEQ for review in April 2004.
--	C.2	**CTC, CTO Requirement:** New condition. Added to reflect current agency guidance.
C.2	C.3	**Operations and Maintenance Manual Requirement:** Updated language to reflect current agency guidance.
C.3	C.4	**Materials Handling/Storage:** Renumbered.
C.5	C.5	**Licensed Operator Requirement:** Renumbered.
C.4	C.6	**Reliability Class:** Renumbered.
C6	C.7	**Sludge Reopener:** Renumbered.
--	C.8	**TMDL Reopener:** New condition. Added to reflect current agency guidance.
C.9	C.9	**Compliance Reporting:** Updated language to reflect current agency guidance on compliance reporting and significant digits.
C.7	C.10	**Sludge Use and Disposal:** Updated language to reflect current agency guidance. Change also reflects transfer of the program from VDH to DEQ.
--	C.11	**Effluent Monitoring Frequencies:** New condition. Added to reflect facility's eligibility for reduced monitoring frequencies. See Attachment 6 for evaluation.
C.8	--	**Closure Plan**: Removed. Language no longer included in permits per current agency guidance.
C.10	--	**In-Stream Water Quality Monitoring:** Removed. Planning staff reviewed the data and determined that the in-stream monitoring program would be discontinued. See Attachment 8.

24. **Variances/Alternate Limits or Conditions**:

- Reduced Monitoring Frequencies: Permittees having exemplary operations that consistently meet permit requirements are considered for reduced monitoring per Guidance memorandum 98-2005 and in accordance with EPA's "Interim Guidance for Performance-Based Reduction of NPDES Permit Monitoring Frequencies" (EPA 833-B-96-001). The facility has consistently been in compliance with the terms and limitations of the permit and has not been a party to any enforcement action during the past three years. The facility is, therefore, eligible for reduced

monitoring frequencies evaluation. See Attachment 6 for Reduced Monitoring Frequencies Evaluation.

25. **Regulation of Users (9 VAC 25-31-280 B 9):**
Not Applicable - The facility is owned by a state agency.

26. **Public Notice Information required by 9 VAC 25-31-280 B**:
All pertinent information is on file and may be inspected, and copied by contacting:

Ms. Jaime Bauer at:
Virginia DEQ Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060
Telephone No. (804) 527-5015
Email Address: jlbauer@deq.virginia.gov

Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address, and telephone number of the writer, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing if public response is significant. Requests for public hearings shall state the reason why a hearing is requested, the nature of the issues proposed to be raised in the public hearing and a brief explanation of how the requester's interests would be directly and adversely affected by the proposed permit action. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given.

27. **Additional Comments**:

a. **Previous Board Action**: None

b. **Staff Comments:**

- The permittee recently submitted an environmental impact report to the DEQ for upgrades to the existing plant. Prior to operation and discharge from the upgraded plant, all parameters evaluated for this permit reissuance will need to be re-evaluated and additional parameters and special conditions may be required. The facility is proposing to use UV disinfection rather then chlorination.
- Groundwater monitoring is not typically required of polishing ponds. If at a later time it is determined that a problem may exist from the polishing pond, groundwater monitoring may be required.
- During final review of the permit package, a rounding error with regard to the total reduced chlorine limitation was discovered. Analysis of chlorine resulted in the need for a weekly average TRC limitation of 0.002858 mg/L. The limitation was rounded to 0.0028 mg/L in the version that was public noticed. The correct expression in two significant figures is 0.0029 mg/L. The final permit is being issued with a TRC limitation expressed as 0.0029 mg/L. Since the actual limitation did not change, only how it is expressed, there is no need to the permit to be sent back through the public notice process.

  Also, the monitoring frequency for ammonia was changed from once per quarter and once per six months to once per month after the public comment period closed. After final permit review, staff determined that reduced monitoring was not appropriate for ammonia since the months in which the seasonal ammonia limitations changed from the previous permit cycle. In order to be eligible for reduced monitoring the facility must demonstrate compliance with the limitations. Under the changed seasonal months, that data is not yet available. The facility may be eligible for reduced monitoring frequency of ammonia during the next permit reissuance after demonstrating that they are able to meet all ammonia permit limitations in this permit. An

additional public comment period is not necessary since the monitoring frequency requirement of ammonia is increasing.

c. **Public Comment:** No comments received

28. **303(d) Listed Segments (TMDL)**:
This facility does not discharge to a stream segment that is listed on the current 303(d) list.

29. **Summary of Attachments:**
1. Flow Frequency Memorandum
2. Facility Diagram
3. Topographic Map
4. October 17, 1975 Memo on WLA for Interstate 85 Rest Stop – Brunswick County
5. Permit Limit Development
    - 5A. MSTRANTI Data Source Table
    - 5B. STORET Data
    - 5C. DMR data
    - 5D. MIX.exe
    - 5E. MSTRANTI.xls
    - 5F. STATS.exe Output for TRC and NH_3
6. Reduced Monitoring Frequencies Evaluation
7. Site Visit Memorandum
8. Stream Monitoring Data Analysis – Sturgeon Creek, UT
9. Temperature Data and Evaluation

Attachment 1 – Flow Frequency Memorandum

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office
4949-A Cox Road Glen Allen, Virginia 23060

SUBJECT: Flow Frequency Determination / 303(d) Status
VDOT ~~I-86~~ I-85 Brunswick Rest Area STP – VA00061379

TO: Jaime Bauer

FROM: Jennifer V. Palmore, P.G.

DATE: January 23, 2008
REVISED: March 18, 2008

COPIES: File

The Virginia Department of Transportation's I-85 Brunswick Rest Area discharges to an unnamed tributary of Sturgeon Creek in Brunswick County, VA. The rivermile for the discharge is 5AXBM002.06. Flow frequencies have been requested at this site for use in developing effluent limitations for the VPDES permit.

The DEQ conducted several stream flow measurements on the unnamed tributary of Sturgeon Creek directly above the I-85 outfall (Unnamed Tributary to Sturgeon Creek, near Alberta, VA #02045275) from June 1998 through June 2002. The measurements were correlated with the same day daily mean values from the USGS continuous record gauge on the Meherrin River at Emporia, VA (#02052000.) The measurements and daily mean values were plotted on a logarithmic graph and a best fit power trend line was plotted through the data points. The flow frequencies from the reference gage were plugged into the equation for the regression line to calculate the associated flow frequencies at the measurement site. The flow frequencies for the gauge and measurement site/discharge point are presented below. The regression analysis is attached.

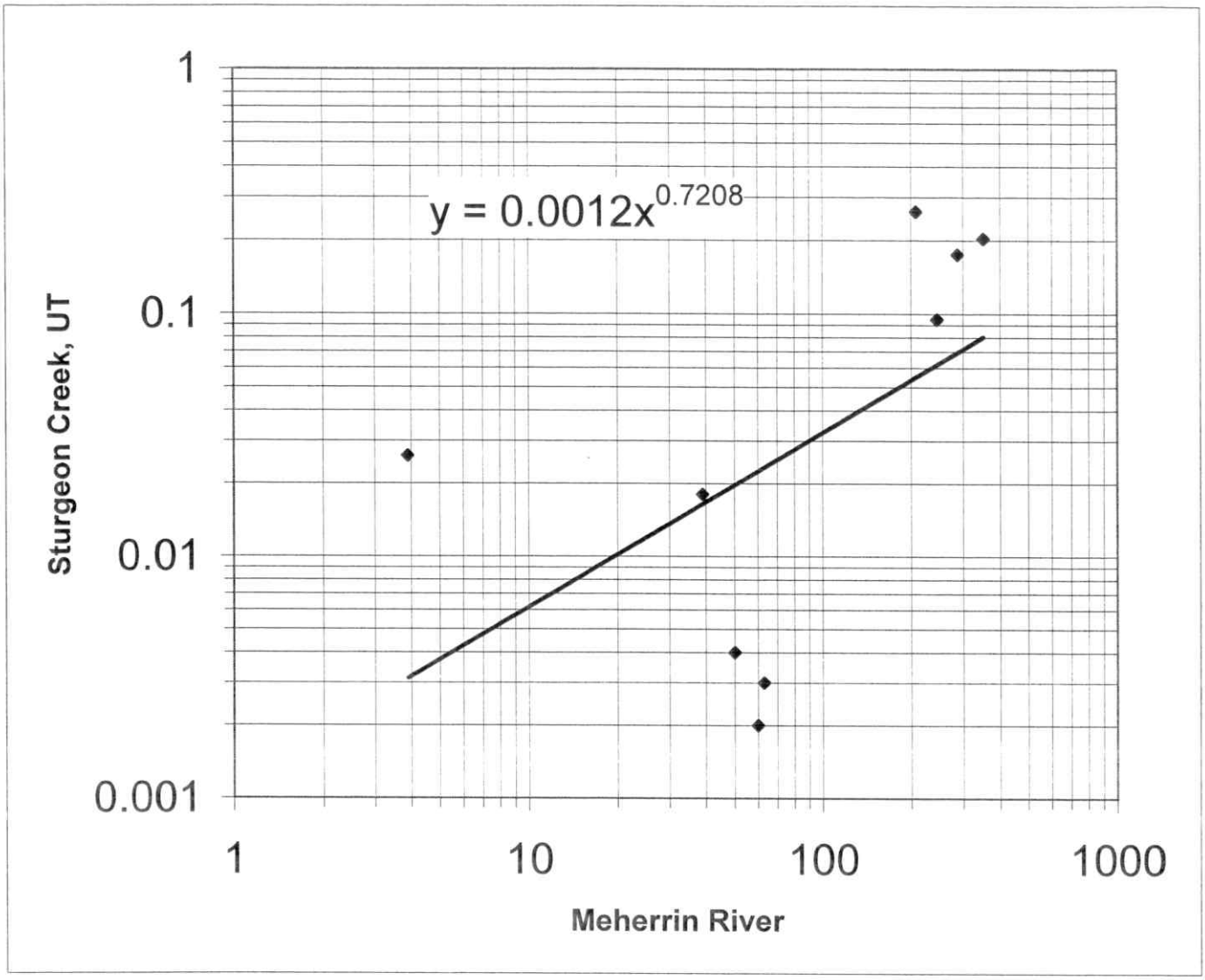
Meherrin River at Emporia, VA (#02052000):
Drainage Area = 747 mi^2
Statistical period = 1986-2003

1Q30 = 4.1 cfs	High Flow 1Q10 = 99 cfs
1Q10 = 7.6 cfs	High Flow 7Q10 = 155 cfs
7Q10 = 18 cfs	High Flow 30Q10 = 254 cfs
30Q10 = 28 cfs	HM = 144 cfs
30Q5 = 41 cfs	

Sturgeon Creek, UT:
Drainage area = 1.68 mi^2

1Q30 = 0.003 cfs (0.002 MGD)	High Flow 1Q10 = 0.033 cfs (0.021 MGD)
1Q10 = 0.005 cfs (0.003 MGD)	High Flow 7Q10 = 0.045 cfs (0.029 MGD)
7Q10 = 0.010 cfs (0.006 MGD)	High Flow 30Q10 = 0.065 cfs (0.042 MGD)
30Q10 = 0.013 cfs (0.009 MGD)	HM = 0.043 cfs (0.028 MGD)
30Q5 = 0.017 cfs (0.011 MGD)	

Unnamed Tributary to Sturgeon Creek, near Alberta, VA #02045275
vs Meherrin River at Emporia, VA #02052000



Flow Data (cfs)

Date	Sturgeon, UT	Meherrin
6/23/1998	0.095	245
9/1/1998	0.002	60
9/14/1998	0.003	63
9/28/1998	0.004	50
5/19/1999	0.203	352
8/16/1999	0.175	287
5/10/2001	0.262	208
10/22/2001	0.018	39
6/26/2002	0.026	3.9

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.834217
R Square	0.695918
Adjusted R Square	0.652478
Standard Error	0.059515
Observations	9

Flow Frequencies (cfs)

Meherrin		Sturgeon, UT
4.1	1Q30	0.003
7.6	1Q10	0.005
18	7Q10	0.010
28	30Q10	0.013
41	30Q5	0.017
99	HF 1Q10	0.033
155	HF 7Q10	0.045
254	HF 30Q10	0.065
144	HM	0.043
747	DA (mi^2)	1.68

HF Months: Jan-Apr
Period: 1986-2003

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office
4949-A Cox Road Glen Allen, Virginia 23060

SUBJECT: Flow Frequency Determination / 303(d) Status
VDOT I-86 Brunswick Rest Area STP – VA00061379

TO: Jaime Bauer

FROM: Jennifer V. Palmore, P.G.

DATE: January 23, 2008

COPIES: File

The Virginia Department of Transportation's I-85 Brunswick Rest Area discharges to an unnamed tributary of Sturgeon Creek in Brunswick County, VA. The rivermile for the discharge is 5AXBN000.38. Flow frequencies have been requested at this site for use in developing effluent limitations for the VPDES permit.

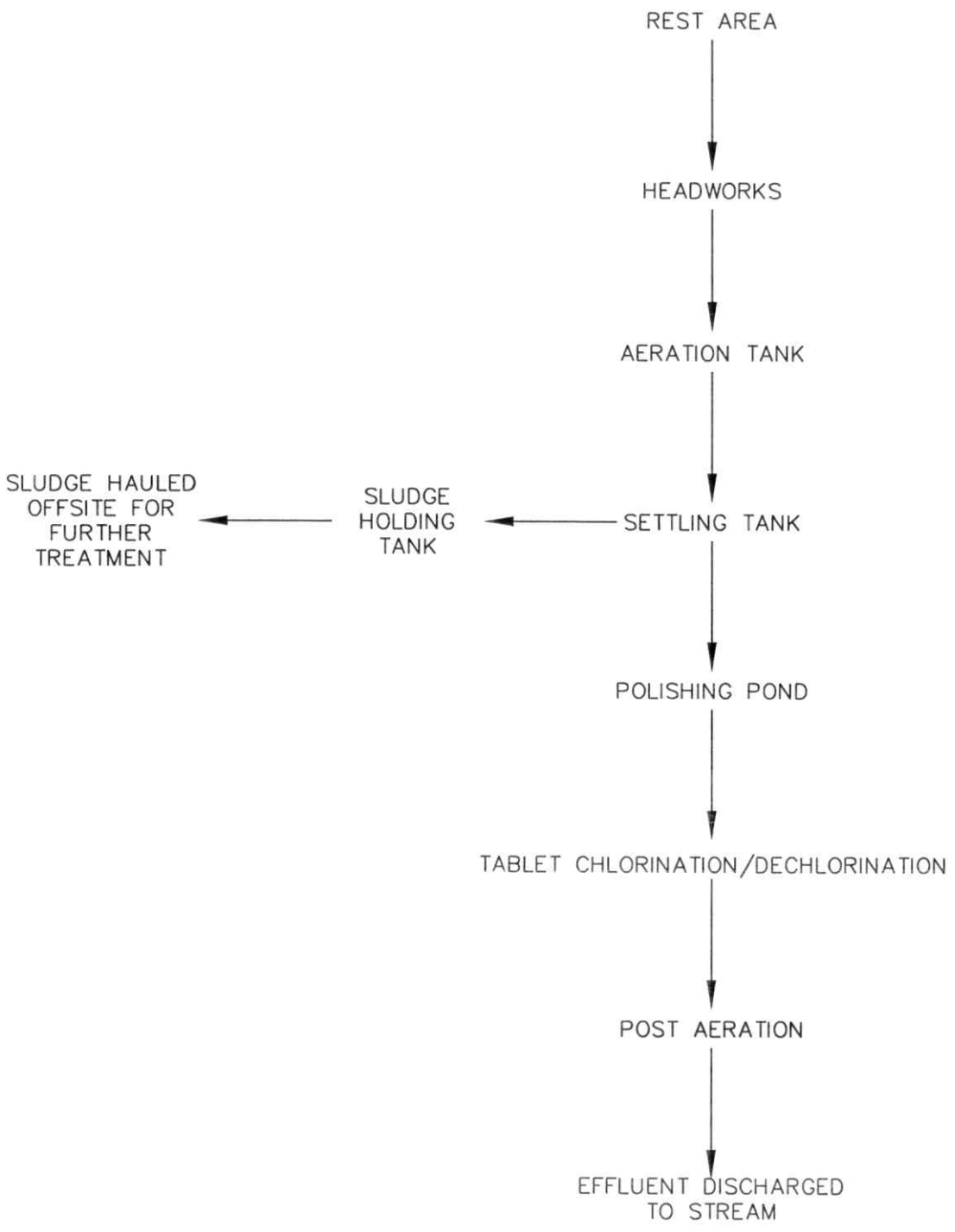
At the discharge point, the receiving stream is shown as an intermittent stream on the USGS Lawrenceville Quadrangle. The flow frequencies for dry ditches and intermittent streams are listed below:

UT to Sturgeon Creek:

1Q30 = 0.00 cfs	High Flow 1Q10 = 0.00 cfs
1Q10 = 0.00 cfs	High Flow 7Q10 = 0.00cfs
7Q10 = 0.00 cfs	High Flow 30Q10 = 0.00 cfs
30Q10 = 0.00 cfs	HM = 0.00 cfs
30Q5 = 0.00 cfs	

The unnamed tributary was not assessed during the 2006 305(b)/303(d) cycle. If you have any questions concerning this analysis, please let me know.

Attachment 2 - Facility Diagram



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VDOT BRUNSWICK COUNTY REST AREA

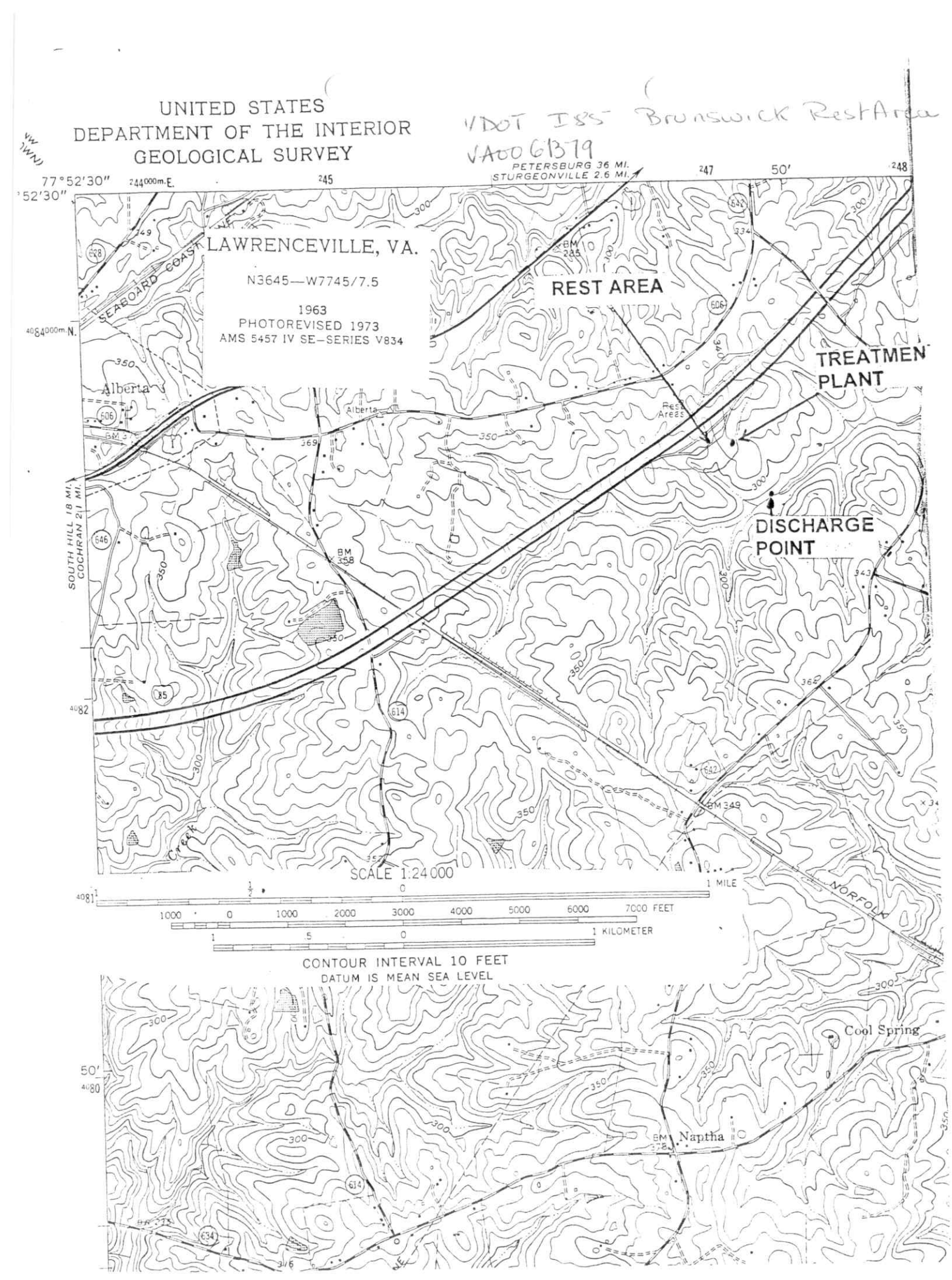
BRUNSWICK COUNTY, VIRGINIA

LINE DIAGRAM

JOB NO.	SHEET NO.
25119	G

SCALE	CHECKED BY	DESIGNED BY	DRAWN BY	DATE
NTS	I. MUTOTT	M. PATEL	S. SCOTT	12/07

DATE	REVISION DESCRIPTION


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
VDOT I85 Brunswick Rest Area
VA00 6379
77°52'30"
52'30"
244000m.E.
245
247
50'
248
PETERSBURG 36 MI.
STURGEONVILLE 2.6 MI.
LAWRENCEVILLE, VA.
N3645—W7745/7.5
1963
PHOTOREVISED 1973
AMS 5457 IV SE—SERIES V834
SEABOARD COAST
REST AREA
TREATMEN
PLANT
DISCHARGE
POINT
Alberta
Rest Areas
BM 235
BM 358
BM 349
4084000m.N.
4082
4081
SOUTH HILL 18 MI.
COCHRAN 21 MI.
SCALE 1:24 000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER
CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL
NORFOLK
Cool Spring
Naptha
BM 378
50'
4080

Attachment 4 –
October 17, 1975 Memo on WLA for
Interstate 85 Rest Stop – Brunswick County

Attachment 5 – Permit Limit Development:

Attachment 5A: MSTRANTI Data Source Table
Attachment 5B: STORET Data
Attachment 5C: DMR data
Attachment 5D: MIX.exe
Attachment 5E: MSTRANTI.xls
Attachment 5F: STATS.exe Output for TRC and NH_3

Attachment 5A: MSTRANTI DATA SOURCE REPORT

VA0061379 –VDOT I-85 Brunswick County Rest Area

Stream Information:	
Mean Hardness	STORET DATA: 5-ASTG005.96 (Attachment 5B)
90% Temperature	STORET DATA: 5-ASTG005.96 (Attachment 5B)
90% Maximum pH	STORET DATA: 5-ASTG005.96 (Attachment 5B)
10% Maximum pH	STORET DATA: 5-ASTG005.96 (Attachment 5B)
Tier Designation	As advised by planning unit.
Stream Flows:	
All Data	Flow Frequency Memorandum (Attachment 1)
Mixing Information:	
Flow Analysis	MIX.exe (Attachment 5D)
Effluent Information:	
Mean Hardness	BPJ
90% Temperature	Summer Average from Form 2A Section A.12
90% Temperature - Winter	BPJ
90% Maximum pH	DMR data (Attachment 5C)
10% Maximum pH	DMR data (Attachment 5C)
Discharge Flow	Design Flow as reported in Permit Application Form 2A

Attachment 5B - STORET Data

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
5ASTG005.96	9/13/1990	S	.30	20.80	6.73		6.20
5ASTG005.96	12/5/1990	S	.30	6.90	7.24	10.81	10.80
5ASTG005.96	12/5/1990	B	1.00	6.92	7.24	10.81	
5ASTG005.96	3/28/1991	S	.09			9.34	
5ASTG005.96	3/28/1991	B	.30	17.79	6.68	9.34	
5ASTG005.96	6/19/1991	S	.30	22.20	6.35		6.99
5ASTG005.96	9/19/1991	S	.30	24.49	5.97	2.93	
5ASTG005.96	9/19/1991	S	304.50				
5ASTG005.96	12/19/1991	S	.30	2.02	7.03	13.63	
5ASTG005.96	3/18/1992	S	.30	10.34	5.56	10.58	
5ASTG005.96	6/22/1992	S	.30	17.97	6.12	7.50	
5ASTG005.96	9/21/1992	S	.30	21.35	6.47	4.63	
5ASTG005.96	12/8/1992	S	.30	3.63	6.86	11.98	
5ASTG005.96	3/16/1993	S	.30	4.84	5.98	12.32	
5ASTG005.96	6/9/1993	S	.30	22.67	6.34	6.95	
5ASTG005.96	9/23/1993	S	.30	19.33	6.65	3.73	
5ASTG005.96	12/15/1993	S	.30	4.78	6.60	11.95	
5ASTG005.96	3/14/1994	S	.30	10.11	6.24	10.06	
5ASTG005.96	6/13/1994	S	.30	22.05	6.62	7.15	
5ASTG005.96	9/14/1994	S	.30	17.29	6.57	5.78	
5ASTG005.96	12/19/1994	S	.30	6.92	6.76	11.10	
5ASTG005.96	3/8/1995	S	.30	12.84	6.57	9.41	
5ASTG005.96	6/6/1995	S	.30	21.07	6.54	7.08	
5ASTG005.96	9/6/1995	S	.30	18.04	6.48	1.08	
5ASTG005.96	12/6/1995	S	.30	8.21	6.56	11.05	
5ASTG005.96	3/28/1996	S	.30	8.21	6.27	11.04	
5ASTG005.96	6/17/1996	S	.30	22.81	6.56	7.57	
5ASTG005.96	9/12/1996	S	.30	21.51	6.28	7.27	
5ASTG005.96	12/18/1996	S	.30	8.50	6.22	10.52	
5ASTG005.96	3/11/1997	S	.30	9.72	6.57	11.68	
5ASTG005.96	6/18/1997	S	.30	20.79	6.45	8.27	
5ASTG005.96	8/5/1997	S	.30	21.39	6.12	7.43	
5ASTG005.96	10/15/1997	S	.30	15.78	6.60	5.82	
5ASTG005.96	12/16/1997	S	.30	2.92	6.84	13.00	
5ASTG005.96	2/10/1998	S	.30	5.01	6.53	12.41	
5ASTG005.96	4/9/1998	S	.30	17.66	6.52	8.30	
5ASTG005.96	6/17/1998	S	.30	20.73	6.62	6.92	
5ASTG005.96	8/26/1998	S	.30	22.18	6.34	3.15	
5ASTG005.96	10/29/1998	S	.30	12.19	6.45	9.50	
5ASTG005.96	12/17/1998	S	.30	4.88	5.94	11.41	
5ASTG005.96	2/17/1999	S	.30	6.86	6.35	11.56	
5ASTG005.96	4/15/1999	S	.30	13.26	6.34	8.87	
5ASTG005.96	6/17/1999	S	.30	19.01	6.58	7.76	
5ASTG005.96	8/12/1999	S	.30	22.89	6.50	5.55	
5ASTG005.96	10/26/1999	S	.30	9.71	6.25	9.93	
5ASTG005.96	12/21/1999	S	.30	9.10	6.12	10.28	
5ASTG005.96	2/24/2000	S	.30				
5ASTG005.96	4/17/2000	S	.30	16.97	6.39	8.90	
5ASTG005.96	6/26/2000	S	.30	24.30	6.73	6.64	
5ASTG005.96	8/14/2000	S	.30	21.34	5.84	8.82	
5ASTG005.96	10/19/2000	S	.30	14.65	6.45	8.68	

Attachment 5B - STORET Data

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler
5ASTG005.96	12/14/2000	S	.30	4.69	6.62	12.37	
5ASTG005.96	2/12/2001	S	.30	5.18	6.80	11.55	
5ASTG005.96	4/9/2001	S	.30	17.60	6.37	8.10	
5ASTG005.96	2/8/2007	S	.30	2.40	6.60	13.60	
5ASTG005.96	4/17/2007	S	.30	12.20	5.80	9.80	
5ASTG005.96	6/21/2007	S	.30	20.00	6.70	7.20	
5ASTG005.96	7/31/2007	S	.30	22.10	6.40	6.10	
5ASTG005.96	10/29/2007	S	.30	11.20	7.30	6.60	
5ASTG005.96	12/27/2007	S	.30	5.60	6.10	11.10	
5ASTG005.96	2/7/2008	S	.30	12.10	7.40		
90th Percentile				**22.2**	**6.8**		
10th Percentile				**4.8**	**6.1**		

WET SEASON	
Date	**Temp Celcius**
12/5/1990	6.9
12/5/1990	6.92
3/28/1991	17.79
12/19/1991	2.02
3/18/1992	10.34
12/8/1992	3.63
3/16/1993	4.84
12/15/1993	4.78
3/14/1994	10.11
12/19/1994	6.92
3/8/1995	12.84
12/6/1995	8.21
3/28/1996	8.21
12/18/1996	8.5
3/11/1997	9.72
12/16/1997	2.92
2/10/1998	5.01
4/9/1998	17.66
12/17/1998	4.88
2/17/1999	6.86
4/15/1999	13.26
12/21/1999	9.1
4/17/2000	16.97
12/14/2000	4.69
2/12/2001	5.18
4/9/2001	17.6
2/8/2007	2.4
4/17/2007	12.2
12/27/2007	5.6
2/7/2008	12.1
90th Percentile	17.033

Attachment 5B - STORET Data						00900 HARDNESS, TOTAL (MG/L AS CACO3)	
						Value	Com Code
Sta Id	Collection Date Time	Depth Desc	Depth	Container Id Desc	Comment		
5ASTG005.96	09/13/1990 13:00	S	0.3	R	STORET DATA CONVERSION	44.0	
	12/05/1990 12:10	S	0.3	R	STORET DATA CONVERSION	28.0	
	03/28/1991 12:28	B	0.3	R	STORET DATA CONVERSION	16.0	
	06/19/1991 13:50	S	0.3	R	STORET DATA CONVERSION	36.0	
	09/19/1991 14:25	S	0.3	R	STORET DATA CONVERSION	34.0	
	12/19/1991 12:35	S	0.3	R	STORET DATA CONVERSION		
	03/18/1992 13:20	S	0.3	R	STORET DATA CONVERSION	11.0	
	06/22/1992 13:00	S	0.3	R	STORET DATA CONVERSION	24.0	
	09/21/1992 13:00	S	0.3	R	STORET DATA CONVERSION	40.0	
	12/08/1992 13:35	S	0.3	R	STORET DATA CONVERSION	20.0	
	03/16/1993 13:33	S	0.3	R	STORET DATA CONVERSION	14.0	
	06/09/1993 13:00	S	0.3	R	STORET DATA CONVERSION	18.0	
	09/23/1993 15:05	S	0.3	R	STORET DATA CONVERSION	28.0	
	12/15/1993 13:31	S	0.3	R	STORET DATA CONVERSION	22.0	
	03/14/1994 14:12	S	0.3	R	STORET DATA CONVERSION	11.0	
	06/13/1994 13:57	S	0.3	R	STORET DATA CONVERSION	18.0	
	09/14/1994 13:00	S	0.3	R	STORET DATA CONVERSION	22.0	
	12/19/1994 11:21	S	0.3	R	STORET DATA CONVERSION	16.0	
	03/08/1995 13:45	S	0.3	R	STORET DATA CONVERSION	16.0	
	06/06/1995 11:45	S	0.3	R	STORET DATA CONVERSION	19.0	
	09/06/1995 10:00	S	0.3	R	STORET DATA CONVERSION	28.0	
	12/06/1995 16:15	S	0.3	R	STORET DATA CONVERSION	18.0	
	03/28/1996 13:24	S	0.3	R	STORET DATA CONVERSION	24.0	
	06/17/1996 12:12	S	0.3	R	STORET DATA CONVERSION	10.0	
	09/12/1996 10:00	S	0.3	R	STORET DATA CONVERSION	22.0	
	12/18/1996 10:22	S	0.3	R	STORET DATA CONVERSION	15.0	
	03/11/1997 10:20	S	0.3	R	STORET DATA CONVERSION	18.5	
	06/18/1997 10:30	S	0.3	R	STORET DATA CONVERSION	20.6	
	08/05/1997 11:40	S	0.3	R	STORET DATA CONVERSION	19.2	
	10/15/1997 12:22	S	0.3	R	STORET DATA CONVERSION	20.9	
	12/16/1997 14:00	S	0.3	R	STORET DATA CONVERSION	14.5	
	02/10/1998 12:45	S	0.3	R	STORET DATA CONVERSION	11.2	
	04/09/1998 12:45	S	0.3	R	STORET DATA CONVERSION	14.1	
	06/17/1998 09:20	S	0.3	R	STORET DATA CONVERSION	16.4	
	08/26/1998 12:45	S	0.3	R	STORET DATA CONVERSION	21.7	
	10/29/1998 13:00	S	0.3	R	STORET DATA CONVERSION	19.0	
	12/17/1998 12:10	S	0.3	R	STORET DATA CONVERSION	17.0	
	02/17/1999 11:25	S	0.3	R		42.0	
	04/15/1999 14:00	S	0.3	R		28.0	
	06/17/1999 12:30	S	0.3	R		16.7	
	08/12/1999 12:05	S	0.3	R		20.1	
	12/21/1999 13:55	S	0.3	R	FLOW ABOVE NORMAL	16.7	
	02/24/2000 10:00	S	0.3	R		10.0	
	04/17/2000 13:30	S	0.3	R		14.0	
	06/26/2000 13:30	S	0.3	R		15.5	
	08/14/2000 13:45	S	0.3	R	ABOVE NORMAL	12.2	
	10/19/2000 13:15	S	0.3	R	NORMAL FLOW	14.4	
	12/14/2000 12:20	S	0.3	R	NORMAL FLOW	13.1	
	02/12/2001 12:00	S	0.3	R		13.2	
	04/09/2001 11:05	S	0.3	R		9.0	
Mean						**19.8**	

Attachment 5C

VA0061379 - VDOT I-85 Brunswick Rest Area - DMR Data

	FLOW		pH		BOD5				TSS			
Received Date	Quant Avg	Quanti Max	Conc Min	Conc Max	Quant Avg	Quanti Max	Conc Avg	Conc Max	Quant Avg	Quanti Max	Conc Avg	Conc Max
09-Feb-2000	0.0023299	0.016546	6.7	8	0.0045571	0.004557	14	14	0.0048826	0.0048826	15	15
10-Mar-2000	0.0039751	0.0039751	6.6	8.1	0.0045571	0.004557	14	14	0.0139969	0.0139969	43	43
11-Apr-2000	0.001637	0.014083	6.5	8	0.0009522	0.000952	18	18	0.0006877	0.0006877	13	13
11-May-2000	0.006	0.025	6	7.7	0.1878	0.1878	3	3	0.1878	0.1878	3	3
09-Jun-2000	0.004	0.022	6.7	7.8	0.007	0.007	2	2	0.01	0.01	3	3
10-Jul-2000	0.0075	0.013	6.9	8.4	0.059	0.059	3	3	0.137	0.137	7	7
10-Aug-2000	0.011	0.02	7.2	8.2	0.068	0.068	2	2	0.068	0.068	2	2
08-Sep-2000	0.009	0.013	6.9	8	0.04	0.04	<2.0	<2.0	0.243	0.243	6	6
10-Oct-2000	0.007	0.013	6.7	8.3	0.06	0.06	3	3	0.1	0.1	5	5
07-Nov-2000	0.007	0.01	7.1	8.3	0.09	0.09	4	4	0.06	0.06	3	3
08-Dec-2000	0.007	0.02	6.3	7.9	0.29	0.29	12	12	0.27	0.27	11	11
10-Jan-2001	0.008	0.021	7.2	8.3	0.1	0.1	5	5	0.08	0.08	4	4
09-Feb-2001	0.006	0.01	7.5	8.4	0.16	0.16	5	5	0.32	0.32	10	10
07-Mar-2001	0.006	0.011	7.8	8.5	0.12	0.12	7	7	0.12	0.12	7	7
06-Apr-2001	0.008	0.012	7.6	8.4	0.06	0.06	3	3	0.25	0.25	12	12
10-May-2001	0.011	0.018	7.3	8.6	0.045	0.045	2	2	0.247	0.247	11	11
08-Jun-2001	0.0107	0.0205	7.5	8.5	0.139	0.139	4	4	0.299	0.299	8.6	8.6
10-Jul-2001	0.011	0.017	7.5	8.5	<.092	<.092	<2	<2	0.439	0.439	9.5	9.5
10-Aug-2001	0.013	0.027	7.5	8	0.3	0.3	5	5	<0.06	<0.06	<1	<1
10-Sep-2001	0.013	0.021	7	8.5	0.091	0.091	3	3	0.042	0.042	1.4	1.4
09-Oct-2001	0.013	0.018	6.5	8	0.454	0.454	12	12	0.28	0.28	7.4	7.4
09-Nov-2001	0.012	0.018	7.5	8	0.238	0.238	7	7	0.051	0.051	1.5	1.5
10-Dec-2001	0.015	0.029	7.5	8.5	0.076	0.076	2	2	0.114	0.114	3	3
10-Jan-2002	0.013	0.027	7.9	8.5	0.114	0.114	3	3	0.288	0.288	7.6	7.6
11-Feb-2002	0.008	0.018	8	8.5	<.076	<.076	<2	<2	0.257	0.257	6.8	6.8
11-Mar-2002	0.008	0.012	8	8.5	0.13	0.13	4	4	0.374	0.374	11.5	11.5
10-Apr-2002	0.01	0.018	8	8.5	0.34	0.34	9	9	0.5	0.5	13.3	13.3
10-May-2002	0.012	0.019	7.5	8	0.29	0.29	5	5	0.9	0.9	15.9	15.9
10-Jun-2002	0.011	0.018	8	8	0.159	0.159	6	6	0.424	0.424	16	16
10-Jul-2002	0.01	0.016	8	8	0.492	0.492	10	10	0.743	0.743	15.1	15.1
09-Aug-2002	0.012	0.019	7.5	8.5	<0.4	0.79	<11.5	21	0.9	1.5	23.7	39.6
10-Sep-2002	0.01	0.0148	7.5	8	0.3	0.3	6	6	0.4	0.4	10.9	10.9
10-Oct-2002	0.007	0.019	8	8.5	0.06	0.06	4	4	0.04	0.04	2.8	2.8
12-Nov-2002	0.006	0.01	7.5	8.5	0.2	0.5	12.7	38	0.2	0.2	17.6	17.6
10-Dec-2002	0.007	0.016	7.5	8	0.11	0.11	6	6	0.13	0.13	7	7
10-Jan-2003	0.007	0.019	7.5	8	0.08	0.08	7	7	0.3	0.3	15	15
10-Feb-2003	0.008	0.008	7	8	0.2	0.2	14	14	0.1	0.1	8	8
10-Mar-2003	0.005	0.0075	7.5	8	0.12	0.12	8	8	0.06	0.06	4	4
09-Apr-2003	0.007	0.015	7	8	0.22	0.22	15	15	0.59	0.92	25.5	64
09-May-2003	0.09	0.014	7	8	0.18	0.18	6	6	0.27	0.27	9	9
10-Jun-2003	0.009	0.017	7.5	8	0.3	0.3	8	8	0.4	0.4	13	13
10-Jul-2003	0.011	0.019	7.5	8	0.4	0.4	5	5	0.3	0.3	4	4
11-Aug-2003	0.01	0.017	7.5	8	0.5	0.5	14	14	0.2	0.2	5	5
09-Sep-2003	0.007	0.012	7.5	8	<0.1	<0.1	<5.0	<5.0	0.09	0.09	4	4
10-Oct-2003	0.007	0.012	7.5	8	<0.1	<0.1	<5.0	<5.0	0.06	0.06	3	3
10-Nov-2003	0.0086	0.0209	7.5	8	<.0473	<0.473	<5.0	<5.0	0.0473	0.0473	5	5
10-Dec-2003	0.007	0.0159	7	8	0.0908	0.0908	8	8	0.1022	0.1022	9	9
12-Jan-2004	0.0055	0.0114	7.5	8	0.1855	0.1855	10	10	0.2597	0.2597	14	14
10-Feb-2004	0.0054	0.0085	7	8	0.1404	0.1404	7	7	0.2608	0.2608	13	13
10-Mar-2004	0.0069	0.011	7.5	8	0.14	0.14	6	6	0.12	0.12	5	5
12-Apr-2004	0.0086	0.0178	7.5	8	<QL	<QL	<QL	<QL	0.223	0.223	7	7
10-May-2004	0.0086	0.0156	7.5	8	<QL	<QL	<QL	<QL	0.0802	0.0802	4	4
10-Jun-2004	0.0087	0.0147	7.5	8	<QL	<QL	<QL	<QL	0.059	0.059	2	2
12-Jul-2004	0.01104	0.0188	7	8	<QL	<QL	<QL	<QL	0.0416	0.0416	2	2
10-Aug-2004	0.0088	0.014	7	8	<QL	<QL	<QL	<QL	0.2392	0.2392	8	8

Attachment 5C

VA0061379 - VDOT I-85 Brunswick Rest Area - DMR Data

	FLOW		pH		BOD5				TSS			
Received Date	Quant Avg	Quanti Max	Conc Min	Conc Max	Quant Avg	Quanti Max	Conc Avg	Conc Max	Quant Avg	Quanti Max	Conc Avg	Conc Max
10-Sep-2004	0.0073	0.0124	7	8	<QL	<QL	<QL	<QL	0.1431	0.1431	7	7
12-Oct-2004	0.00736	0.013	7.5	8	0.1192	0.1192	5	5	0.2623	0.2623	11	11
10-Nov-2004	0.0079	0.0189	7.5	8	0.1033	0.1033	7	7	0.1033	0.1033	7	7
10-Dec-2004	0.00705	0.013	7.5	8	0.2544	0.2544	16	16	0.4008	0.62	23.5	39
10-Jan-2005	0.0052	0.0112	7.5	8	0.4663	0.4663	11	11	0.2967	0.2967	7	7
10-Feb-2005	0.0057	0.0088	7.5	7.5	0.0977	0.0977	6	6	0.01302	0.01302	8	8
10-Mar-2005	0.00743	0.0127	7.5	8	0.2559	0.2559	13	13	0.2559	0.2559	13	13
11-Apr-2005	0.0083	0.0147	7	8	0.2706	0.2706	11	11	0.1968	0.1968	8	8
10-May-2005	0.0091	0.0167	7	8	<QL	<QL	<QL	<QL	0.1438	0.1438	5	5
10-Jun-2005	0.00949	0.0141	7	8	0.2491	0.2491	7	7	0.4625	0.4625	13	13
11-Jul-2005	0.01095	0.0173	7.5	8	<QL	<QL	<QL	<QL	0.3967	0.3967	8	8
10-Aug-2005	0.0092	0.0139	7	8.5	<QL	<QL	<QL	<QL	0.1325	0.1325	5	5
12-Sep-2005	0.0074	0.0116	7.5	8.5	<QL	<QL	<QL	<QL	0.1756	0.1756	4	4
11-Oct-2005	0.00759	0.0113	7	8	<QL	<QL	<QL	<QL	0.0893	0.0893	4	4
10-Nov-2005	0.0082	0.0194	7.5	8	0.1003	0.1003	5	5	0.1805	0.1805	9	9
12-Dec-2005	0.00751	0.0153	7	7.5	0.1787	0.1787	8	8	0.536	0.536	24	24
10-Jan-2006	0.0057	0.0107	7.5	7.5	0.279	0.279	11	11	0.3804	0.3804	15	15
10-Feb-2006	0.00568	0.0109	7.5	8	0.0886	0.0886	6	6	0.1329	0.1329	9	9
10-Mar-2006	0.0061	0.0103	7.5	7.5	<QL	<QL	<QL	<QL	0.1033	0.1033	7	7
10-Apr-2006	0.0078	0.014	7.5	7.5	0.1431	0.1431	7	7	0.0613	0.0613	3	3
10-May-2006	0.0076	0.0136	7.5	8	<QL	<QL	<QL	<QL	0.1363	0.1363	5	5
12-Jun-2006	0.0081	0.0146	7.5	8	<QL	<QL	<QL	<QL	0.0969	0.0969	4	4
10-Jul-2006	0.0092	0.0155	7.5	8	<QL	<QL	<QL	<QL	0.2067	0.2067	7	7
09-Aug-2006	0.0083	0.0154	7.5	8.5	<QL	<QL	<QL	<QL	0.5382	0.5382	18	18
11-Sep-2006	0.0071	0.0123	7.5	8	<QL	<QL	<QL	<QL	0.2793	0.2793	6	6
10-Oct-2006	0.0075	0.022	7.5	8	<QL	<QL	<QL	<QL	0.0818	0.0818	4	4
13-Nov-2006	0.00793	0.0251	7.5	8	<QL	<QL	<QL	<QL	0.134	0.134	6	6
10-Feb-2006	0.0081	0.0149	7.5	8.5	<QL	<QL	<QL	<QL	0.0693	0.0693	3	3
10-Jan-2007	0.0035	0.0116	7.5	8.5	<QL	<QL	<QL	<QL	0.056	0.056	4	4
12-Feb-2007	0.0055	0.0081	7.5	8.5	0.112	0.112	8	8	0.112	0.112	8	8
12-Mar-2007	0.00691	0.0114	7.5	8	0.1908	0.1908	7	7	0.5723	0.5723	21	21
10-Apr-2007	0.00847	0.0131	7.5	8.5	0.3365	0.5325	14	21	0.5072	0.5072	20	20
10-May-2007	0.00857	0.0143	7.5	8.5	0.3952	0.3952	12	12	0.2305	0.2305	7	7
11-Jun-2007	0.0093	0.0157	7.5	8	<QL	<QL	<QL	<QL	0.0783	0.0783	3	3
09-Jul-2007	0.01062	0.0168	7.5	8	<QL	<QL	<QL	<QL	0.1408	0.1408	4	4
10-Aug-2007	0.00948	0.0148	7.5	8	0.2729	0.2729	7	7	0.9029	1.7543	23.5	45
10-Sep-2007	0.00744	0.0133	7.5	8	<QL	<QL	<QL	<QL	0.151	0.151	3	3
09-Oct-2007	0.00796	0.0141	7	8	<QL	<QL	<QL	<QL	0.0386	0.0386	2	2
13-Nov-2007	0.00841	0.0197	7.5	8	<QL	<QL	<QL	<QL	0.0693	0.0693	3	3
10-Dec-2007	0.00763	0.0166	7.5	8	0.1166	0.1166	7	7	0.0666	0.0666	4	4
10-Jan-2008	0.0056	0.0109	7.5	8	0.2332	0.2332	14	14	0.1998	0.1998	12	12
AVERAGE:	**0.0089736**	**0.0153438**	**7.3479**	**8.10313**	**0.1814057**	**0.198399**	**7.70952**	**8.42188**	**0.2255883**	**0.2466472**	**8.9694737**	**9.93158**
90th Percentile:			**7.5**	**8.5**								
10th Percentile:			**6.95**	**8**								

Attachment 5C

VA0061379 - VDOT I-85 Brunswick Rest Area - DMR Data

CL2, Conc Avg	CL2, Conc Max	DO Conc Min	CL2, Total Contact Conc Min	CL2, INST TECH MIN LIMIT Conc Min
0	0	6	0.4	0.4
0	0	6.8	1	1
0	0	6.5	1.2	1.2
0	0	5	1	1
0	0	6.5	1	1
0	0	6.5	1	1
0	0	6.8	1	1
0	0	6.5	1	1
0	0	7.9	1	1
0	0	7.6	1	1
0	0	9.4	1	1
0	0	9.6	1	1
0	0	8.9	1	1
0	0	11.1	1	1
0	0	10.1	1	1
0	0	8.4	1	1
0	0	7.9	1	1.1
0	0	7.71	1.1	1.52
0	0	7.27	1.52	1.31
0	0	7.64	1.31	1.3
0	0	7.8	1.3	1.2
0	0	9.12	1.2	1.01
0	0	10	1.01	1.01
0	0	9.85	1.01	1.4
0	0	9.44	1.4	1.11
0	0	7.01	1.11	1.5
0	0	9.43	1.5	1.3
0	0	7.73	1.3	1
0	0	7.02	1	1.1
0	0	7.04	1.1	1.53
0	0	6.71	1.53	1
0	0	6.53	1	1.02
0	0	7.2	1.02	1.63
0	0	7.46	1.63	1.62
0	0	10.04	1.62	1.1
0	0	10.95	1.1	1.02
0	0	11.67	1.02	1.01
0	0	9.86	1.01	1.01
0	0	9.65	1.01	1.05
0	0	9.72	1.05	1.02
0	0	7.92	0.74	0.74
0	0	6.64	0.8	0.8
0	0	6.71	1	1
0	0	7.4	1.03	1.03
0	0	8.39	0.86	0.86
<QL	<QL	7.68	1.11	1.11
<QL	<QL	9.91	1.02	1.02
<QL	<QL	9.43	0.97	0.97
<QL	<QL	10.5	1.02	1.02
<QL	<QL	9.12	1.01	1.01
<QL	<QL	6.85	1.04	1.04
<QL	<QL	7.11	1.02	1.02
<QL	<QL	6.68	1.04	1.04
<QL	<QL	6.92	0.82	0.82
<QL	<QL	6.99	1	1

AMMONIA, AS N

DEC-APR		MAY-NOV	
Conc Avg	Conc Max	Conc Avg	Conc Max
		0.2	0.2
<QL	<QL	0.2	0.2
0.23	0.23	0.11	0.11
<QL	<QL	0.87	5.2
0.54	0.54	<QL	<QL
0.27	0.27	0.24	0.24
<QL	<QL	0.21	0.21
0.33	0.33	0.29	0.29
<QL	<QL	0.23	0.23
0.78	0.78	0.31	0.31
1.5	1.5	0.24	0.24
<QL	<QL	<QL	<QL
0.85	0.85	<QL	<QL
1.3	1.3	<QL	<QL
2.05	5.2	0.81	0.81
<QL	<QL	0.31	0.31
<QL	<QL	1.13	1.5
0.07	0.07	<QL	<QL
0.24	0.24	<QL	<QL
<QL	<QL	<QL	<QL
0.22	0.22	0.31	0.31
0.74181818	**1.028181818**	<QL	<QL
		0.24	0.24
		0.22	0.22
		0.33	0.33
		0.24	0.24
		<QL	<QL
		<QL	<QL
		<QL	<QL
		0.36055556	**0.621666667**

Attachment 5C

VA0061379 - VDOT I-85 Brunswick Rest Area - DMR Data

	CL2,	DO	CL2, Total Contact	CL2, INST TECH MIN LIMIT
Conc Avg	Conc Max	Conc Min	Conc Min	Conc Min
<QL	<QL	6.6	0.86	0.86
<QL	<QL	7.52	0.87	0.87
<QL	<QL	8.03	1.11	1.11
<QL	<QL	7.93	1.1	1.1
<QL	<QL	9.25	1.06	1.06
<QL	<QL	11.02	1.07	1.07
<QL	<QL	9.83	1.01	1.01
<QL	<QL	8.6	1.05	1.05
<QL	<QL	8.32	1.04	1.04
<QL	<QL	6.96	1	1
<QL	<QL	6.58	1	1
<QL	<QL	7.08	1.06	1.06
<QL	<QL	6.58	1.03	1.03
<QL	<QL	7.81	1.08	1.08
<QL	<QL	8.93	1.28	1.28
<QL	<QL	9.63	1.16	1.16
<QL	<QL	9.91	1	1
<QL	<QL	9.45	1.38	1.38
<QL	<QL	9.69	1.03	1.03
<QL	<QL	6.74	1.05	1.05
<QL	<QL	7.33	1.02	1.02
<QL	<QL	7.18	1.01	1.01
<QL	<QL	6.61	1	1
<QL	<QL	6.89	1.01	1.01
<QL	<QL	7.48	0.87	0.87
<QL	<QL	8.44	1.01	1.01
<QL	<QL	10.03	1.04	1.04
<QL	<QL	10.34	1.02	1.02
<QL	<QL	10.51	1.08	1.08
<QL	<QL	11.89	1.16	1.16
<QL	<QL	10.07	1.02	1.02
<QL	<QL	7.93	1.01	1.01
<QL	<QL	6.55	1.01	1.01
<QL	<QL	6.53	1.02	1.02
<QL	<QL	6.52	1	1
<QL	<QL	6.56	1	1
<QL	<QL	6.63	1.01	1.01
<QL	<QL	7.18	1.01	1.01
<QL	<QL	10.17	1.01	1.01
<QL	<QL	10.64	1.01	1.01
<QL	<QL	10.18	1.36	1.36
0	**0**	**8.21583**	**1.0609375**	**1.061145833**

Attachment 5D

***Mixing Zone Predictions* for VA0061379**

Mixing Zone Predictions for VDOT I-85 Rest Area

Effluent Flow = 0.036 MGD
Stream 7Q10 = 0.006 MGD
Stream 30Q10 = 0.009 MGD
Stream 1Q10 = 0.003 MGD
Stream slope = 0.0038 ft/ft
Stream width = 4 ft
Bottom scale = 3
Channel scale = 1

Stream flows based on Flow Frequency Determination Memorandum dated January 23, 2008 and Revised March 18, 2008.

Mixing Zone Predictions @ 7Q10

Depth = .0958 ft
Length = 104.54 ft
Velocity = .1695 ft/sec
Residence Time = .0071 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

Mixing Zone Predictions @ 30Q10

Depth = .1 ft
Length = 100.78 ft
Velocity = .1741 ft/sec
Residence Time = .0067 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

Mixing Zone Predictions @ 1Q10

Depth = .0916 ft
Length = 108.66 ft
Velocity = .1647 ft/sec
Residence Time = .1832 hours

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 1Q10 may be used.

Virginia DEQ Mixing Zone Analysis Version 2.1

Mixing Zone Predictions for VA0061379 for High Flow

Effluent Flow = 0.036 MGD
Stream 7Q10 = 0.029 MGD
Stream 30Q10 = 0.042 MGD
Stream 1Q10 = 0.021 MGD
Stream slope = 0.0038 ft/ft
Stream width = 4 ft
Bottom scale = 3
Channel scale = 1

Stream flows based on Flow Frequency Determination Memorandum dated January 23, 2008 and Revised March 18, 2008.

Mixing Zone Predictions @ 7Q10

Depth = .1252 ft
Length = 82.9 ft
Velocity = .2008 ft/sec
Residence Time = .0048 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 7Q10 may be used.

Mixing Zone Predictions @ 30Q10

Depth = .1401 ft
Length = 75.11 ft
Velocity = .2154 ft/sec
Residence Time = .004 days

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 30Q10 may be used.

Mixing Zone Predictions @ 1Q10

Depth = .1156 ft
Length = 88.87 ft
Velocity = .1908 ft/sec
Residence Time = .1294 hours

Recommendation:

A complete mix assumption is appropriate for this situation and the entire 1Q10 may be used.

Virginia DEQ Mixing Zone Analysis Version 2.1

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: VDOT I-85 Rest Area Brunswick County Permit No.: VA0061379 - Annual

Receiving Stream: UT to Sturgeon Creek Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		Stream Flows		Mixing Information		Effluent Information	
Mean Hardness (as CaCO3) =	19.8 mg/L	1Q10 (Annual) =	0.003 MGD	Annual - 1Q10 Mix =	100 %	Mean Hardness (as CaCO3) =	25 mg/L
90% Temperature (Annual) =	22.2 deg C	7Q10 (Annual) =	0.006 MGD	- 7Q10 Mix =	100 %	90% Temp (Annual) =	27.5 deg C
90% Temperature (Wet season) =	17.033 deg C	30Q10 (Annual) =	0.009 MGD	- 30Q10 Mix =	100 %	90% Temp (Wet season) =	deg C
90% Maximum pH =	6.8 SU	1Q10 (Wet season) =	MGD	Wet Season - 1Q10 Mix =	100 %	90% Maximum pH =	8.5 SU
10% Maximum pH =	6.1 SU	30Q10 (Wet season) =	MGD	- 30Q10 Mix =	100 %	10% Maximum pH =	8 SU
Tier Designation (1 or 2) =	2	30Q5 =	MGD			Discharge Flow =	0.036 MGD
Public Water Supply (PWS) Y/N? =	n	Harmonic Mean =	MGD				
Trout Present Y/N? =	n	Annual Average =	N/A MGD				
Early Life Stages Present Y/N? =	y						

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	0	--	--	na	2.7E+03	--	--	na	2.7E+03	--	--	na	2.7E+02	--	--	na	2.7E+02	--	--	**na**	**2.7E+02**
Acrolein	0	--	--	na	7.8E+02	--	--	na	7.8E+02	--	--	na	7.8E+01	--	--	na	7.8E+01	--	--	**na**	**7.8E+01**
Acrylonitrile [C]	0	--	--	na	6.6E+00	--	--	na	6.6E+00	--	--	na	6.6E-01	--	--	na	6.6E-01	--	--	**na**	**6.6E-01**
Aldrin [C]	0	3.0E+00	--	na	1.4E-03	3.3E+00	--	na	1.4E-03	7.5E-01	--	na	1.4E-04	8.1E-01	--	na	1.4E-04	**8.1E-01**	--	**na**	**1.4E-04**
Ammonia-N (mg/l) (Yearly)	0	1.17E+01	2.08E+00	na	--	1.3E+01	2.6E+00	na	--	2.92E+00	5.21E-01	na	--	3.2E+00	6.5E-01	na	--	**3.2E+00**	**6.5E-01**	**na**	--
Ammonia-N (mg/l) (High Flow)	0	3.20E+00	1.09E+00	na	--	3.2E+00	1.1E+00	na	--	8.01E-01	2.72E-01	na	--	8.0E-01	2.7E-01	na	--	**8.0E-01**	**2.7E-01**	**na**	--
Anthracene	0	--	--	na	1.1E+05	--	--	na	1.1E+05	--	--	na	1.1E+04	--	--	na	1.1E+04	--	--	**na**	**1.1E+04**
Antimony	0	--	--	na	4.3E+03	--	--	na	4.3E+03	--	--	na	4.3E+02	--	--	na	4.3E+02	--	--	**na**	**4.3E+02**
Arsenic	o	3.4E+02	1.5E+02	na	--	3.7E+02	1.8E+02	na	--	8.5E+01	3.8E+01	na	--	9.2E+01	4.4E+01	na	--	**9.2E+01**	**4.4E+01**	**na**	--
Barium	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	**na**	--
Benzene [C]	0	--	--	na	7.1E+02	--	--	na	7.1E+02	--	--	na	7.1E+01	--	--	na	7.1E+01	--	--	**na**	**7.1E+01**
Benzidine [C]	0	--	--	na	5.4E-03	--	--	na	5.4E-03	--	--	na	5.4E-04	--	--	na	5.4E-04	--	--	**na**	**5.4E-04**
Benzo (a) anthracene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	**na**	**4.9E-02**
Benzo (b) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	**na**	**4.9E-02**
Benzo (k) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	**na**	**4.9E-02**
Benzo (a) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	**na**	**4.9E-02**
Bis2-Chloroethyl Ether	0	--	--	na	1.4E+01	--	--	na	1.4E+01	--	--	na	1.4E+00	--	--	na	1.4E+00	--	--	**na**	**1.4E+00**
Bis2-Chloroisopropyl Ether	0	--	--	na	1.7E+05	--	--	na	1.7E+05	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	**na**	**1.7E+04**
Bromoform [C]	0	--	--	na	3.6E+03	--	--	na	3.6E+03	--	--	na	3.6E+02	--	--	na	3.6E+02	--	--	**na**	**3.6E+02**
Butylbenzylphthalate	0	--	--	na	5.2E+03	--	--	na	5.2E+03	--	--	na	5.2E+02	--	--	na	5.2E+02	--	--	**na**	**5.2E+02**
Cadmium	0	8.2E-01	3.8E-01	na	--	8.9E-01	4.5E-01	na	--	2.1E-01	9.5E-02	na	--	2.2E-01	1.1E-01	na	--	**2.2E-01**	**1.1E-01**	**na**	--
Carbon Tetrachloride [C]	0	--	--	na	4.4E+01	--	--	na	4.4E+01	--	--	na	4.4E+00	--	--	na	4.4E+00	--	--	**na**	**4.4E+00**
Chlordane [C]	0	2.4E+00	4.3E-03	na	2.2E-02	2.6E+00	5.0E-03	na	2.2E-02	6.0E-01	1.1E-03	na	2.2E-03	6.5E-01	1.3E-03	na	2.2E-03	**6.5E-01**	**1.3E-03**	**na**	**2.2E-03**
Chloride	0	8.6E+05	2.3E+05	na	--	9.3E+05	2.7E+05	na	--	2.2E+05	5.8E+04	na	--	2.3E+05	6.7E+04	na	--	**2.3E+05**	**6.7E+04**	**na**	--
TRC	0	1.9E+01	1.1E+01	na	--	2.1E+01	1.3E+01	na	--	4.8E+00	2.8E+00	na	--	5.1E+00	3.2E+00	na	--	**5.1E+00**	**3.2E+00**	**na**	--
Chlorobenzene	0	--	--	na	2.1E+04	--	--	na	2.1E+04	--	--	na	2.1E+03	--	--	na	2.1E+03	--	--	**na**	**2.1E+03**

Attachment 5E

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Chlorodibromomethane [C]	0	--	--	na	3.4E+02	--	--	na	3.4E+02	--	--	na	3.4E+01	--	--	na	3.4E+01	--	--	na	3.4E+01
Chloroform [C]	0	--	--	na	2.9E+04	--	--	na	2.9E+04	--	--	na	2.9E+03	--	--	na	2.9E+03	--	--	na	2.9E+03
2-Chloronaphthalene	0	--	--	na	4.3E+03	--	--	na	4.3E+03	--	--	na	4.3E+02	--	--	na	4.3E+02	--	--	na	4.3E+02
2-Chlorophenol	0	--	--	na	4.0E+02	--	--	na	4.0E+02	--	--	na	4.0E+01	--	--	na	4.0E+01	--	--	na	4.0E+01
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	9.0E-02	4.8E-02	na	--	2.1E-02	1.0E-02	na	--	2.2E-02	1.2E-02	na	--	2.2E-02	1.2E-02	na	--
Chromium III	0	1.8E+02	2.4E+01	na	--	2.0E+02	2.8E+01	na	--	4.6E+01	6.0E+00	na	--	5.0E+01	6.9E+00	na	--	5.0E+01	6.9E+00	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.7E+01	1.3E+01	na	--	4.0E+00	2.8E+00	na	--	4.3E+00	3.2E+00	na	--	4.3E+00	3.2E+00	na	--
Chromium, Total	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Chrysene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	na	4.9E-02
Copper	0	3.6E+00	2.7E+00	na	--	3.9E+00	3.2E+00	na	--	9.1E-01	6.8E-01	na	--	9.9E-01	8.0E-01	na	--	9.9E-01	8.0E-01	na	--
Cyanide	0	2.2E+01	5.2E+00	na	2.2E+05	2.4E+01	6.1E+00	na	2.2E+05	5.5E+00	1.3E+00	na	2.2E+04	6.0E+00	1.5E+00	na	2.2E+04	6.0E+00	1.5E+00	na	2.2E+04
DDD [C]	0	--	--	na	8.4E-03	--	--	na	8.4E-03	--	--	na	8.4E-04	--	--	na	8.4E-04	--	--	na	8.4E-04
DDE [C]	0	--	--	na	5.9E-03	--	--	na	5.9E-03	--	--	na	5.9E-04	--	--	na	5.9E-04	--	--	na	5.9E-04
DDT [C]	0	1.1E+00	1.0E-03	na	5.9E-03	1.2E+00	1.2E-03	na	5.9E-03	2.8E-01	2.5E-04	na	5.9E-04	3.0E-01	2.9E-04	na	5.9E-04	3.0E-01	2.9E-04	na	5.9E-04
Demeton	0	--	1.0E-01	na	--	--	1.2E-01	na	--	--	2.5E-02	na	--	--	2.9E-02	na	--	--	2.9E-02	na	--
Dibenz(a,h)anthracene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	na	4.9E-02
Dibutyl phthalate	0	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	na	1.2E+03	--	--	na	1.2E+03	--	--	na	1.2E+03
Dichloromethane (Methylene Chloride) [C]	0	--	--	na	1.6E+04	--	--	na	1.6E+04	--	--	na	1.6E+03	--	--	na	1.6E+03	--	--	na	1.6E+03
1,2-Dichlorobenzene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	na	1.7E+03	--	--	na	1.7E+03	--	--	na	1.7E+03
1,3-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	na	2.6E+02	--	--	na	2.6E+02	--	--	na	2.6E+02
1,4-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	na	2.6E+02	--	--	na	2.6E+02	--	--	na	2.6E+02
3,3-Dichlorobenzidine [C]	0	--	--	na	7.7E-01	--	--	na	7.7E-01	--	--	na	7.7E-02	--	--	na	7.7E-02	--	--	na	7.7E-02
Dichlorobromomethane [C]	0	--	--	na	4.6E+02	--	--	na	4.6E+02	--	--	na	4.6E+01	--	--	na	4.6E+01	--	--	na	4.6E+01
1,2-Dichloroethane [C]	0	--	--	na	9.9E+02	--	--	na	9.9E+02	--	--	na	9.9E+01	--	--	na	9.9E+01	--	--	na	9.9E+01
1,1-Dichloroethylene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	na	1.7E+03	--	--	na	1.7E+03	--	--	na	1.7E+03
1,2-trans-dichloroethylene	0	--	--	na	1.4E+05	--	--	na	1.4E+05	--	--	na	1.4E+04	--	--	na	1.4E+04	--	--	na	1.4E+04
2,4-Dichlorophenol	0	--	--	na	7.9E+02	--	--	na	7.9E+02	--	--	na	7.9E+01	--	--	na	7.9E+01	--	--	na	7.9E+01
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
1,2-Dichloropropane [C]	0	--	--	na	3.9E+02	--	--	na	3.9E+02	--	--	na	3.9E+01	--	--	na	3.9E+01	--	--	na	3.9E+01
1,3-Dichloropropene	0	--	--	na	1.7E+03	--	--	na	1.7E+03	--	--	na	1.7E+02	--	--	na	1.7E+02	--	--	na	1.7E+02
Dieldrin [C]	0	2.4E-01	5.6E-02	na	1.4E-03	2.6E-01	6.5E-02	na	1.4E-03	6.0E-02	1.4E-02	na	1.4E-04	6.5E-02	1.6E-02	na	1.4E-04	6.5E-02	1.6E-02	na	1.4E-04
Diethyl Phthalate	0	--	--	na	1.2E+05	--	--	na	1.2E+05	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	na	1.2E+04
Di-2-Ethylhexyl Phthalate [C]	0	--	--	na	5.9E+01	--	--	na	5.9E+01	--	--	na	5.9E+00	--	--	na	5.9E+00	--	--	na	5.9E+00
2,4-Dimethylphenol	0	--	--	na	2.3E+03	--	--	na	2.3E+03	--	--	na	2.3E+02	--	--	na	2.3E+02	--	--	na	2.3E+02
Dimethyl Phthalate	0	--	--	na	2.9E+06	--	--	na	2.9E+06	--	--	na	2.9E+05	--	--	na	2.9E+05	--	--	na	2.9E+05
Di-n-Butyl Phthalate	0	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	na	1.2E+03	--	--	na	1.2E+03	--	--	na	1.2E+03
2,4 Dinitrophenol	0	--	--	na	1.4E+04	--	--	na	1.4E+04	--	--	na	1.4E+03	--	--	na	1.4E+03	--	--	na	1.4E+03
2-Methyl-4,6-Dinitrophenol	0	--	--	na	7.65E+02	--	--	na	7.7E+02	--	--	na	7.7E+01	--	--	na	7.7E+01	--	--	na	7.7E+01
2,4-Dinitrotoluene [C]	0	--	--	na	9.1E+01	--	--	na	9.1E+01	--	--	na	9.1E+00	--	--	na	9.1E+00	--	--	na	9.1E+00
Dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin) (ppq)	0	--	--	na	1.2E-06	--	--	na	na	--	--	na	1.2E-07	--	--	na	1.2E-07	--	--	na	na
1,2-Diphenylhydrazine [C]	0	--	--	na	5.4E+00	--	--	na	5.4E+00	--	--	na	5.4E-01	--	--	na	5.4E-01	--	--	na	5.4E-01
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.4E-01	6.5E-02	na	2.4E+02	5.5E-02	1.4E-02	na	2.4E+01	6.0E-02	1.6E-02	na	2.4E+01	6.0E-02	1.6E-02	na	2.4E+01
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.4E-01	6.5E-02	na	2.4E+02	5.5E-02	1.4E-02	na	2.4E+01	6.0E-02	1.6E-02	na	2.4E+01	6.0E-02	1.6E-02	na	2.4E+01
Endosulfan Sulfate	0	--	--	na	2.4E+02	--	--	na	2.4E+02	--	--	na	2.4E+01	--	--	na	2.4E+01	--	--	na	2.4E+01
Endrin	0	8.6E-02	3.6E-02	na	8.1E-01	9.3E-02	4.2E-02	na	8.1E-01	2.2E-02	9.0E-03	na	8.1E-02	2.3E-02	1.1E-02	na	8.1E-02	2.3E-02	1.1E-02	na	8.1E-02
Endrin Aldehyde	0	--	--	na	8.1E-01	--	--	na	8.1E-01	--	--	na	8.1E-02	--	--	na	8.1E-02	--	--	na	8.1E-02

Attachment 5E

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Ethylbenzene	0	--	--	na	2.9E+04	--	--	na	2.9E+04	--	--	na	2.9E+03	--	--	na	2.9E+03	--	--	na	2.9E+03
Fluoranthene	0	--	--	na	3.7E+02	--	--	na	3.7E+02	--	--	na	3.7E+01	--	--	na	3.7E+01	--	--	na	3.7E+01
Fluorene	0	--	--	na	1.4E+04	--	--	na	1.4E+04	--	--	na	1.4E+03	--	--	na	1.4E+03	--	--	na	1.4E+03
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Guthion	0	--	1.0E-02	na	--	--	1.2E-02	na	--	--	2.5E-03	na	--	--	2.9E-03	na	--	--	2.9E-03	na	--
Heptachlor [C]	0	5.2E-01	3.8E-03	na	2.1E-03	5.6E-01	4.4E-03	na	2.1E-03	1.3E-01	9.5E-04	na	2.1E-04	1.4E-01	1.1E-03	na	2.1E-04	1.4E-01	1.1E-03	na	2.1E-04
Heptachlor Epoxide [C]	0	5.2E-01	3.8E-03	na	1.1E-03	5.6E-01	4.4E-03	na	1.1E-03	1.3E-01	9.5E-04	na	1.1E-04	1.4E-01	1.1E-03	na	1.1E-04	1.4E-01	1.1E-03	na	1.1E-04
Hexachlorobenzene [C]	0	--	--	na	7.7E-03	--	--	na	7.7E-03	--	--	na	7.7E-04	--	--	na	7.7E-04	--	--	na	7.7E-04
Hexachlorobutadiene [C]	0	--	--	na	5.0E+02	--	--	na	5.0E+02	--	--	na	5.0E+01	--	--	na	5.0E+01	--	--	na	5.0E+01
Hexachlorocyclohexane Alpha-BHC [C]	0	--	--	na	1.3E-01	--	--	na	1.3E-01	--	--	na	1.3E-02	--	--	na	1.3E-02	--	--	na	1.3E-02
Hexachlorocyclohexane Beta-BHC [C]	0	--	--	na	4.6E-01	--	--	na	4.6E-01	--	--	na	4.6E-02	--	--	na	4.6E-02	--	--	na	4.6E-02
Hexachlorocyclohexane Gamma-BHC [C] (Lindane)	0	9.5E-01	na	na	6.3E-01	1.0E+00	--	na	6.3E-01	2.4E-01	--	na	6.3E-02	2.6E-01	--	na	6.3E-02	2.6E-01	--	na	6.3E-02
Hexachlorocyclopentadiene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	na	1.7E+03	--	--	na	1.7E+03	--	--	na	1.7E+03
Hexachloroethane [C]	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	na	8.9E+00	--	--	na	8.9E+00	--	--	na	8.9E+00
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	2.3E+00	na	--	--	5.0E-01	na	--	--	5.8E-01	na	--	--	5.8E-01	na	--
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	na	4.9E-02
Iron	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Isophorone [C]	0	--	--	na	2.6E+04	--	--	na	2.6E+04	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	na	2.6E+03
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--
Lead	0	2.0E+01	2.3E+00	na	--	2.2E+01	2.7E+00	na	--	5.1E+00	5.8E-01	na	--	5.5E+00	6.7E-01	na	--	5.5E+00	6.7E-01	na	--
Malathion	0	--	1.0E-01	na	--	--	1.2E-01	na	--	--	2.5E-02	na	--	--	2.9E-02	na	--	--	2.9E-02	na	--
Manganese	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Mercury	0	1.4E+00	7.7E-01	na	5.1E-02	1.5E+00	9.0E-01	na	5.1E-02	3.5E-01	1.9E-01	na	5.1E-03	3.8E-01	2.2E-01	na	5.1E-03	3.8E-01	2.2E-01	na	5.1E-03
Methyl Bromide	0	--	--	na	4.0E+03	--	--	na	4.0E+03	--	--	na	4.0E+02	--	--	na	4.0E+02	--	--	na	4.0E+02
Methoxychlor	0	--	3.0E-02	na	--	--	3.5E-02	na	--	--	7.5E-03	na	--	--	8.8E-03	na	--	--	8.8E-03	na	--
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--
Monochlorobenzene	0	--	--	na	2.1E+04	--	--	na	2.1E+04	--	--	na	2.1E+03	--	--	na	2.1E+03	--	--	na	2.1E+03
Nickel	0	5.6E+01	6.3E+00	na	4.6E+03	6.1E+01	7.3E+00	na	4.6E+03	1.4E+01	1.6E+00	na	4.6E+02	1.5E+01	1.8E+00	na	4.6E+02	1.5E+01	1.8E+00	na	4.6E+02
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Nitrobenzene	0	--	--	na	1.9E+03	--	--	na	1.9E+03	--	--	na	1.9E+02	--	--	na	1.9E+02	--	--	na	1.9E+02
N-Nitrosodimethylamine [C]	0	--	--	na	8.1E+01	--	--	na	8.1E+01	--	--	na	8.1E+00	--	--	na	8.1E+00	--	--	na	8.1E+00
N-Nitrosodiphenylamine [C]	0	--	--	na	1.6E+02	--	--	na	1.6E+02	--	--	na	1.6E+01	--	--	na	1.6E+01	--	--	na	1.6E+01
N-Nitrosodi-n-propylamine [C]	0	--	--	na	1.4E+01	--	--	na	1.4E+01	--	--	na	1.4E+00	--	--	na	1.4E+00	--	--	na	1.4E+00
Parathion	0	6.5E-02	1.3E-02	na	--	7.0E-02	1.5E-02	na	--	1.6E-02	3.3E-03	na	--	1.8E-02	3.8E-03	na	--	1.8E-02	3.8E-03	na	--
PCB-1016	0	--	1.4E-02	na	--	--	1.6E-02	na	--	--	3.5E-03	na	--	--	4.1E-03	na	--	--	4.1E-03	na	--
PCB-1221	0	--	1.4E-02	na	--	--	1.6E-02	na	--	--	3.5E-03	na	--	--	4.1E-03	na	--	--	4.1E-03	na	--
PCB-1232	0	--	1.4E-02	na	--	--	1.6E-02	na	--	--	3.5E-03	na	--	--	4.1E-03	na	--	--	4.1E-03	na	--
PCB-1242	0	--	1.4E-02	na	--	--	1.6E-02	na	--	--	3.5E-03	na	--	--	4.1E-03	na	--	--	4.1E-03	na	--
PCB-1248	0	--	1.4E-02	na	--	--	1.6E-02	na	--	--	3.5E-03	na	--	--	4.1E-03	na	--	--	4.1E-03	na	--
PCB-1254	0	--	1.4E-02	na	--	--	1.6E-02	na	--	--	3.5E-03	na	--	--	4.1E-03	na	--	--	4.1E-03	na	--
PCB-1260	0	--	1.4E-02	na	--	--	1.6E-02	na	--	--	3.5E-03	na	--	--	4.1E-03	na	--	--	4.1E-03	na	--
PCB Total [C]	0	--	--	na	1.7E-03	--	--	na	1.7E-03	--	--	na	1.7E-04	--	--	na	1.7E-04	--	--	na	1.7E-04

Attachment 5E

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Pentachlorophenol [C]	0	1.0E+01	6.1E+00	na	8.2E+01	1.1E+01	7.2E+00	na	8.2E+01	2.5E+00	1.5E+00	na	8.2E+00	2.8E+00	1.8E+00	na	8.2E+00	**2.8E+00**	**1.8E+00**	**na**	**8.2E+00**
Phenol	0	--	--	na	4.6E+06	--	--	na	4.6E+06	--	--	na	4.6E+05	--	--	na	4.6E+05	--	--	**na**	**4.6E+05**
Pyrene	0	--	--	na	1.1E+04	--	--	na	1.1E+04	--	--	na	1.1E+03	--	--	na	1.1E+03	--	--	**na**	**1.1E+03**
Radionuclides (pCi/l except Beta/Photon)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	**na**	--
Gross Alpha Activity	0	--	--	na	1.5E+01	--	--	na	1.5E+01	--	--	na	1.5E+00	--	--	na	1.5E+00	--	--	**na**	**1.5E+00**
Beta and Photon Activity (mrem/yr)	0	--	--	na	4.0E+00	--	--	na	4.0E+00	--	--	na	4.0E-01	--	--	na	4.0E-01	--	--	**na**	**4.0E-01**
Strontium-90	0	--	--	na	8.0E+00	--	--	na	8.0E+00	--	--	na	8.0E-01	--	--	na	8.0E-01	--	--	**na**	**8.0E-01**
Tritium	0	--	--	na	2.0E+04	--	--	na	2.0E+04	--	--	na	2.0E+03	--	--	na	2.0E+03	--	--	**na**	**2.0E+03**
Selenium	0	2.0E+01	5.0E+00	na	1.1E+04	2.2E+01	5.8E+00	na	1.1E+04	5.0E+00	1.3E+00	na	1.1E+03	5.4E+00	1.5E+00	na	1.1E+03	**5.4E+00**	**1.5E+00**	**na**	**1.1E+03**
Silver	0	3.2E-01	--	na	--	3.4E-01	--	na	--	7.9E-02	--	na	--	8.6E-02	--	na	--	**8.6E-02**	--	**na**	--
Sulfate	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	**na**	--
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	1.1E+02	--	--	na	1.1E+02	--	--	na	1.1E+01	--	--	na	1.1E+01	--	--	**na**	**1.1E+01**
Tetrachloroethylene[C]	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	na	8.9E+00	--	--	na	8.9E+00	--	--	**na**	**8.9E+00**
Thallium	0	--	--	na	6.3E+00	--	--	na	6.3E+00	--	--	na	6.3E-01	--	--	na	6.3E-01	--	--	**na**	**6.3E-01**
Toluene	0	--	--	na	2.0E+05	--	--	na	2.0E+05	--	--	na	2.0E+04	--	--	na	2.0E+04	--	--	**na**	**2.0E+04**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	**na**	--
Toxaphene [C]	0	7.3E-01	2.0E-04	na	7.5E-03	7.9E-01	2.3E-04	na	7.5E-03	1.8E-01	5.0E-05	na	7.5E-04	2.0E-01	5.8E-05	na	7.5E-04	**2.0E-01**	**5.8E-05**	**na**	**7.5E-04**
Tributyltin	0	4.6E-01	6.3E-02	na	--	5.0E-01	7.4E-02	na	--	1.2E-01	1.6E-02	na	--	1.2E-01	1.8E-02	na	--	**1.2E-01**	**1.8E-02**	**na**	--
1,2,4-Trichlorobenzene	0	--	--	na	9.4E+02	--	--	na	9.4E+02	--	--	na	9.4E+01	--	--	na	9.4E+01	--	--	**na**	**9.4E+01**
1,1,2-Trichloroethane[C]	0	--	--	na	4.2E+02	--	--	na	4.2E+02	--	--	na	4.2E+01	--	--	na	4.2E+01	--	--	**na**	**4.2E+01**
Trichloroethylene [C]	0	--	--	na	8.1E+02	--	--	na	8.1E+02	--	--	na	8.1E+01	--	--	na	8.1E+01	--	--	**na**	**8.1E+01**
2,4,6-Trichlorophenol [C]	0	--	--	na	6.5E+01	--	--	na	6.5E+01	--	--	na	6.5E+00	--	--	na	6.5E+00	--	--	**na**	**6.5E+00**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	**na**	--
Vinyl Chloride[C]	0	--	--	na	6.1E+01	--	--	na	6.1E+01	--	--	na	6.1E+00	--	--	na	6.1E+00	--	--	**na**	**6.1E+00**
Zinc	0	3.6E+01	3.6E+01	na	6.9E+04	3.9E+01	4.3E+01	na	6.9E+04	9.1E+00	9.1E+00	na	6.9E+03	9.8E+00	1.1E+01	na	6.9E+03	**9.8E+00**	**1.1E+01**	**na**	**6.9E+03**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens, Harmonic Mean for Carcinogens, and Annual Average for Dioxin. Mixing ratios may be substituted for stream flows where appropriate.

Metal	Target Value (SSTV)
Antimony	4.3E+02
Arsenic	2.6E+01
Barium	na
Cadmium	6.7E-02
Chromium III	4.2E+00
Chromium VI	1.7E+00
Copper	3.9E-01
Iron	na
Lead	4.0E-01
Manganese	na
Mercury	5.1E-03
Nickel	1.1E+00
Selenium	8.8E-01
Silver	3.4E-02
Zinc	3.9E+00

Note: do not use QL's lower than the minimum QL's provided in agency guidance

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: VDOT I-85 Rest Area Brunswick County Permit No.: VA0061379 - Winter

Receiving Stream: UT to Sturgeon Creek Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		Stream Flows		Mixing Information		Effluent Information	
Mean Hardness (as CaCO3) =	19.8 mg/L	1Q10 (Annual) =	0.003 MGD	Annual - 1Q10 Mix =	100 %	Mean Hardness (as CaCO3) =	25 mg/L
90% Temperature (Annual) =	22.2 deg C	7Q10 (Annual) =	0.006 MGD	- 7Q10 Mix =	100 %	90% Temp (Annual) =	14 deg C
90% Temperature (Wet season) =	17.033 deg C	30Q10 (Annual) =	0.009 MGD	- 30Q10 Mix =	100 %	90% Temp (Wet season) =	deg C
90% Maximum pH =	6.8 SU	1Q10 (Wet season) =	MGD	Wet Season - 1Q10 Mix =	100 %	90% Maximum pH =	8.5 SU
10% Maximum pH =	6.1 SU	30Q10 (Wet season) =	MGD	- 30Q10 Mix =	100 %	10% Maximum pH =	8 SU
Tier Designation (1 or 2) =	2	30Q5 =	MGD			Discharge Flow =	0.036 MGD
Public Water Supply (PWS) Y/N? =	n	Harmonic Mean =	MGD				
Trout Present Y/N? =	n	Annual Average =	N/A MGD				
Early Life Stages Present Y/N? =	y						

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Acenapthene	0	--	--	na	2.7E+03	--	--	na	2.7E+03	--	--	na	2.7E+02	--	--	na	2.7E+02	--	--	na	2.7E+02
Acrolein	0	--	--	na	7.8E+02	--	--	na	7.8E+02	--	--	na	7.8E+01	--	--	na	7.8E+01	--	--	na	7.8E+01
Acrylonitrile [C]	0	--	--	na	6.6E+00	--	--	na	6.6E+00	--	--	na	6.6E-01	--	--	na	6.6E-01	--	--	na	6.6E-01
Aldrin [C]	0	3.0E+00	--	na	1.4E-03	3.3E+00	--	na	1.4E-03	7.5E-01	--	na	1.4E-04	8.1E-01	--	na	1.4E-04	8.1E-01	--	na	1.4E-04
Ammonia-N (mg/l) (Yearly)	0	1.17E+01	4.18E+00	na	--	1.3E+01	5.2E+00	na	--	2.92E+00	1.05E+00	na	--	3.2E+00	1.3E+00	na	--	3.2E+00	1.3E+00	na	--
Ammonia-N (mg/l) (High Flow)	0	3.20E+00	1.09E+00	na	--	3.2E+00	1.1E+00	na	--	8.01E-01	2.72E-01	na	--	8.0E-01	2.7E-01	na	--	8.0E-01	2.7E-01	na	--
Anthracene	0	--	--	na	1.1E+05	--	--	na	1.1E+05	--	--	na	1.1E+04	--	--	na	1.1E+04	--	--	na	1.1E+04
Antimony	0	--	--	na	4.3E+03	--	--	na	4.3E+03	--	--	na	4.3E+02	--	--	na	4.3E+02	--	--	na	4.3E+02
Arsenic	o	3.4E+02	1.5E+02	na	--	3.7E+02	1.8E+02	na	--	8.5E+01	3.8E+01	na	--	9.2E+01	4.4E+01	na	--	9.2E+01	4.4E+01	na	--
Barium	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Benzene [C]	0	--	--	na	7.1E+02	--	--	na	7.1E+02	--	--	na	7.1E+01	--	--	na	7.1E+01	--	--	na	7.1E+01
Benzidine [C]	0	--	--	na	5.4E-03	--	--	na	5.4E-03	--	--	na	5.4E-04	--	--	na	5.4E-04	--	--	na	5.4E-04
Benzo (a) anthracene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	na	4.9E-02
Benzo (b) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	na	4.9E-02
Benzo (k) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	na	4.9E-02
Benzo (a) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	na	4.9E-02
Bis2-Chloroethyl Ether	0	--	--	na	1.4E+01	--	--	na	1.4E+01	--	--	na	1.4E+00	--	--	na	1.4E+00	--	--	na	1.4E+00
Bis2-Chloroisopropyl Ether	0	--	--	na	1.7E+05	--	--	na	1.7E+05	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	na	1.7E+04
Bromoform [C]	0	--	--	na	3.6E+03	--	--	na	3.6E+03	--	--	na	3.6E+02	--	--	na	3.6E+02	--	--	na	3.6E+02
Butylbenzylphthalate	0	--	--	na	5.2E+03	--	--	na	5.2E+03	--	--	na	5.2E+02	--	--	na	5.2E+02	--	--	na	5.2E+02
Cadmium	0	8.2E-01	3.8E-01	na	--	8.9E-01	4.5E-01	na	--	2.1E-01	9.5E-02	na	--	2.2E-01	1.1E-01	na	--	2.2E-01	1.1E-01	na	--
Carbon Tetrachloride [C]	0	--	--	na	4.4E+01	--	--	na	4.4E+01	--	--	na	4.4E+00	--	--	na	4.4E+00	--	--	na	4.4E+00
Chlordane [C]	0	2.4E+00	4.3E-03	na	2.2E-02	2.6E+00	5.0E-03	na	2.2E-02	6.0E-01	1.1E-03	na	2.2E-03	6.5E-01	1.3E-03	na	2.2E-03	6.5E-01	1.3E-03	na	2.2E-03
Chloride	0	8.6E+05	2.3E+05	na	--	9.3E+05	2.7E+05	na	--	2.2E+05	5.8E+04	na	--	2.3E+05	6.7E+04	na	--	2.3E+05	6.7E+04	na	--
TRC	0	1.9E+01	1.1E+01	na	--	2.1E+01	1.3E+01	na	--	4.8E+00	2.8E+00	na	--	5.1E+00	3.2E+00	na	--	5.1E+00	3.2E+00	na	--
Chlorobenzene	0	--	--	na	2.1E+04	--	--	na	2.1E+04	--	--	na	2.1E+03	--	--	na	2.1E+03	--	--	na	2.1E+03

Attachment 5E

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Chlorodibromomethane [C]	0	--	--	na	3.4E+02	--	--	na	3.4E+02	--	--	na	3.4E+01	--	--	na	3.4E+01	--	--	na	3.4E+01
Chloroform [C]	0	--	--	na	2.9E+04	--	--	na	2.9E+04	--	--	na	2.9E+03	--	--	na	2.9E+03	--	--	na	2.9E+03
2-Chloronaphthalene	0	--	--	na	4.3E+03	--	--	na	4.3E+03	--	--	na	4.3E+02	--	--	na	4.3E+02	--	--	na	4.3E+02
2-Chlorophenol	0	--	--	na	4.0E+02	--	--	na	4.0E+02	--	--	na	4.0E+01	--	--	na	4.0E+01	--	--	na	4.0E+01
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	9.0E-02	4.8E-02	na	--	2.1E-02	1.0E-02	na	--	2.2E-02	1.2E-02	na	--	2.2E-02	1.2E-02	na	--
Chromium III	0	1.8E+02	2.4E+01	na	--	2.0E+02	2.8E+01	na	--	4.6E+01	6.0E+00	na	--	5.0E+01	6.9E+00	na	--	5.0E+01	6.9E+00	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.7E+01	1.3E+01	na	--	4.0E+00	2.8E+00	na	--	4.3E+00	3.2E+00	na	--	4.3E+00	3.2E+00	na	--
Chromium, Total	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Chrysene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	na	4.9E-02
Copper	0	3.6E+00	2.7E+00	na	--	3.9E+00	3.2E+00	na	--	9.1E-01	6.8E-01	na	--	9.9E-01	8.0E-01	na	--	9.9E-01	8.0E-01	na	--
Cyanide	0	2.2E+01	5.2E+00	na	2.2E+05	2.4E+01	6.1E+00	na	2.2E+05	5.5E+00	1.3E+00	na	2.2E+04	6.0E+00	1.5E+00	na	2.2E+04	6.0E+00	1.5E+00	na	2.2E+04
DDD [C]	0	--	--	na	8.4E-03	--	--	na	8.4E-03	--	--	na	8.4E-04	--	--	na	8.4E-04	--	--	na	8.4E-04
DDE [C]	0	--	--	na	5.9E-03	--	--	na	5.9E-03	--	--	na	5.9E-04	--	--	na	5.9E-04	--	--	na	5.9E-04
DDT [C]	0	1.1E+00	1.0E-03	na	5.9E-03	1.2E+00	1.2E-03	na	5.9E-03	2.8E-01	2.5E-04	na	5.9E-04	3.0E-01	2.9E-04	na	5.9E-04	3.0E-01	2.9E-04	na	5.9E-04
Demeton	0	--	1.0E-01	na	--	--	1.2E-01	na	--	--	2.5E-02	na	--	--	2.9E-02	na	--	--	2.9E-02	na	--
Dibenz(a,h)anthracene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	na	4.9E-02
Dibutyl phthalate	0	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	na	1.2E+03	--	--	na	1.2E+03	--	--	na	1.2E+03
Dichloromethane (Methylene Chloride) [C]	0	--	--	na	1.6E+04	--	--	na	1.6E+04	--	--	na	1.6E+03	--	--	na	1.6E+03	--	--	na	1.6E+03
1,2-Dichlorobenzene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	na	1.7E+03	--	--	na	1.7E+03	--	--	na	1.7E+03
1,3-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	na	2.6E+02	--	--	na	2.6E+02	--	--	na	2.6E+02
1,4-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	na	2.6E+02	--	--	na	2.6E+02	--	--	na	2.6E+02
3,3-Dichlorobenzidine [C]	0	--	--	na	7.7E-01	--	--	na	7.7E-01	--	--	na	7.7E-02	--	--	na	7.7E-02	--	--	na	7.7E-02
Dichlorobromomethane [C]	0	--	--	na	4.6E+02	--	--	na	4.6E+02	--	--	na	4.6E+01	--	--	na	4.6E+01	--	--	na	4.6E+01
1,2-Dichloroethane [C]	0	--	--	na	9.9E+02	--	--	na	9.9E+02	--	--	na	9.9E+01	--	--	na	9.9E+01	--	--	na	9.9E+01
1,1-Dichloroethylene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	na	1.7E+03	--	--	na	1.7E+03	--	--	na	1.7E+03
1,2-trans-dichloroethylene	0	--	--	na	1.4E+05	--	--	na	1.4E+05	--	--	na	1.4E+04	--	--	na	1.4E+04	--	--	na	1.4E+04
2,4-Dichlorophenol	0	--	--	na	7.9E+02	--	--	na	7.9E+02	--	--	na	7.9E+01	--	--	na	7.9E+01	--	--	na	7.9E+01
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
1,2-Dichloropropane [C]	0	--	--	na	3.9E+02	--	--	na	3.9E+02	--	--	na	3.9E+01	--	--	na	3.9E+01	--	--	na	3.9E+01
1,3-Dichloropropene	0	--	--	na	1.7E+03	--	--	na	1.7E+03	--	--	na	1.7E+02	--	--	na	1.7E+02	--	--	na	1.7E+02
Dieldrin [C]	0	2.4E-01	5.6E-02	na	1.4E-03	2.6E-01	6.5E-02	na	1.4E-03	6.0E-02	1.4E-02	na	1.4E-04	6.5E-02	1.6E-02	na	1.4E-04	6.5E-02	1.6E-02	na	1.4E-04
Diethyl Phthalate	0	--	--	na	1.2E+05	--	--	na	1.2E+05	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	na	1.2E+04
Di-2-Ethylhexyl Phthalate [C]	0	--	--	na	5.9E+01	--	--	na	5.9E+01	--	--	na	5.9E+00	--	--	na	5.9E+00	--	--	na	5.9E+00
2,4-Dimethylphenol	0	--	--	na	2.3E+03	--	--	na	2.3E+03	--	--	na	2.3E+02	--	--	na	2.3E+02	--	--	na	2.3E+02
Dimethyl Phthalate	0	--	--	na	2.9E+06	--	--	na	2.9E+06	--	--	na	2.9E+05	--	--	na	2.9E+05	--	--	na	2.9E+05
Di-n-Butyl Phthalate	0	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	na	1.2E+03	--	--	na	1.2E+03	--	--	na	1.2E+03
2,4 Dinitrophenol	0	--	--	na	1.4E+04	--	--	na	1.4E+04	--	--	na	1.4E+03	--	--	na	1.4E+03	--	--	na	1.4E+03
2-Methyl-4,6-Dinitrophenol	0	--	--	na	7.65E+02	--	--	na	7.7E+02	--	--	na	7.7E+01	--	--	na	7.7E+01	--	--	na	7.7E+01
2,4-Dinitrotoluene [C]	0	--	--	na	9.1E+01	--	--	na	9.1E+01	--	--	na	9.1E+00	--	--	na	9.1E+00	--	--	na	9.1E+00
Dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin) (ppq)	0	--	--	na	1.2E-06	--	--	na	na	--	--	na	1.2E-07	--	--	na	1.2E-07	--	--	na	na
1,2-Diphenylhydrazine [C]	0	--	--	na	5.4E+00	--	--	na	5.4E+00	--	--	na	5.4E-01	--	--	na	5.4E-01	--	--	na	5.4E-01
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.4E-01	6.5E-02	na	2.4E+02	5.5E-02	1.4E-02	na	2.4E+01	6.0E-02	1.6E-02	na	2.4E+01	6.0E-02	1.6E-02	na	2.4E+01
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.4E-01	6.5E-02	na	2.4E+02	5.5E-02	1.4E-02	na	2.4E+01	6.0E-02	1.6E-02	na	2.4E+01	6.0E-02	1.6E-02	na	2.4E+01
Endosulfan Sulfate	0	--	--	na	2.4E+02	--	--	na	2.4E+02	--	--	na	2.4E+01	--	--	na	2.4E+01	--	--	na	2.4E+01
Endrin	0	8.6E-02	3.6E-02	na	8.1E-01	9.3E-02	4.2E-02	na	8.1E-01	2.2E-02	9.0E-03	na	8.1E-02	2.3E-02	1.1E-02	na	8.1E-02	2.3E-02	1.1E-02	na	8.1E-02
Endrin Aldehyde	0	--	--	na	8.1E-01	--	--	na	8.1E-01	--	--	na	8.1E-02	--	--	na	8.1E-02	--	--	na	8.1E-02

Attachment 5E

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Ethylbenzene	0	--	--	na	2.9E+04	--	--	na	2.9E+04	--	--	na	2.9E+03	--	--	na	2.9E+03	--	--	na	**2.9E+03**
Fluoranthene	0	--	--	na	3.7E+02	--	--	na	3.7E+02	--	--	na	3.7E+01	--	--	na	3.7E+01	--	--	na	**3.7E+01**
Fluorene	0	--	--	na	1.4E+04	--	--	na	1.4E+04	--	--	na	1.4E+03	--	--	na	1.4E+03	--	--	na	**1.4E+03**
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Guthion	0	--	1.0E-02	na	--	--	1.2E-02	na	--	--	2.5E-03	na	--	--	2.9E-03	na	--	--	**2.9E-03**	na	--
Heptachlor [C]	0	5.2E-01	3.8E-03	na	2.1E-03	5.6E-01	4.4E-03	na	2.1E-03	1.3E-01	9.5E-04	na	2.1E-04	1.4E-01	1.1E-03	na	2.1E-04	**1.4E-01**	**1.1E-03**	na	**2.1E-04**
Heptachlor Epoxide[C]	0	5.2E-01	3.8E-03	na	1.1E-03	5.6E-01	4.4E-03	na	1.1E-03	1.3E-01	9.5E-04	na	1.1E-04	1.4E-01	1.1E-03	na	1.1E-04	**1.4E-01**	**1.1E-03**	na	**1.1E-04**
Hexachlorobenzene[C]	0	--	--	na	7.7E-03	--	--	na	7.7E-03	--	--	na	7.7E-04	--	--	na	7.7E-04	--	--	na	**7.7E-04**
Hexachlorobutadiene[C]	0	--	--	na	5.0E+02	--	--	na	5.0E+02	--	--	na	5.0E+01	--	--	na	5.0E+01	--	--	na	**5.0E+01**
Hexachlorocyclohexane Alpha-BHC[C]	0	--	--	na	1.3E-01	--	--	na	1.3E-01	--	--	na	1.3E-02	--	--	na	1.3E-02	--	--	na	**1.3E-02**
Hexachlorocyclohexane Beta-BHC[C]	0	--	--	na	4.6E-01	--	--	na	4.6E-01	--	--	na	4.6E-02	--	--	na	4.6E-02	--	--	na	**4.6E-02**
Hexachlorocyclohexane Gamma-BHC[C] (Lindane)	0	9.5E-01	na	na	6.3E-01	1.0E+00	--	na	6.3E-01	2.4E-01	--	na	6.3E-02	2.6E-01	--	na	6.3E-02	**2.6E-01**	--	na	**6.3E-02**
Hexachlorocyclopentadiene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	na	1.7E+03	--	--	na	1.7E+03	--	--	na	**1.7E+03**
Hexachloroethane[C]	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	na	8.9E+00	--	--	na	8.9E+00	--	--	na	**8.9E+00**
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	2.3E+00	na	--	--	5.0E-01	na	--	--	5.8E-01	na	--	--	**5.8E-01**	na	--
Indeno (1,2,3-cd) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	na	**4.9E-02**
Iron	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Isophorone[C]	0	--	--	na	2.6E+04	--	--	na	2.6E+04	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	na	**2.6E+03**
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	**0.0E+00**	na	--
Lead	0	2.0E+01	2.3E+00	na	--	2.2E+01	2.7E+00	na	--	5.1E+00	5.8E-01	na	--	5.5E+00	6.7E-01	na	--	**5.5E+00**	**6.7E-01**	na	--
Malathion	0	--	1.0E-01	na	--	--	1.2E-01	na	--	--	2.5E-02	na	--	--	2.9E-02	na	--	--	**2.9E-02**	na	--
Manganese	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Mercury	0	1.4E+00	7.7E-01	na	5.1E-02	1.5E+00	9.0E-01	na	5.1E-02	3.5E-01	1.9E-01	na	5.1E-03	3.8E-01	2.2E-01	na	5.1E-03	**3.8E-01**	**2.2E-01**	na	**5.1E-03**
Methyl Bromide	0	--	--	na	4.0E+03	--	--	na	4.0E+03	--	--	na	4.0E+02	--	--	na	4.0E+02	--	--	na	**4.0E+02**
Methoxychlor	0	--	3.0E-02	na	--	--	3.5E-02	na	--	--	7.5E-03	na	--	--	8.8E-03	na	--	--	**8.8E-03**	na	--
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	0.0E+00	na	--	--	**0.0E+00**	na	--
Monochlorobenzene	0	--	--	na	2.1E+04	--	--	na	2.1E+04	--	--	na	2.1E+03	--	--	na	2.1E+03	--	--	na	**2.1E+03**
Nickel	0	5.6E+01	6.3E+00	na	4.6E+03	6.1E+01	7.3E+00	na	4.6E+03	1.4E+01	1.6E+00	na	4.6E+02	1.5E+01	1.8E+00	na	4.6E+02	**1.5E+01**	**1.8E+00**	na	**4.6E+02**
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--
Nitrobenzene	0	--	--	na	1.9E+03	--	--	na	1.9E+03	--	--	na	1.9E+02	--	--	na	1.9E+02	--	--	na	**1.9E+02**
N-Nitrosodimethylamine[C]	0	--	--	na	8.1E+01	--	--	na	8.1E+01	--	--	na	8.1E+00	--	--	na	8.1E+00	--	--	na	**8.1E+00**
N-Nitrosodiphenylamine[C]	0	--	--	na	1.6E+02	--	--	na	1.6E+02	--	--	na	1.6E+01	--	--	na	1.6E+01	--	--	na	**1.6E+01**
N-Nitrosodi-n-propylamine[C]	0	--	--	na	1.4E+01	--	--	na	1.4E+01	--	--	na	1.4E+00	--	--	na	1.4E+00	--	--	na	**1.4E+00**
Parathion	0	6.5E-02	1.3E-02	na	--	7.0E-02	1.5E-02	na	--	1.6E-02	3.3E-03	na	--	1.8E-02	3.8E-03	na	--	**1.8E-02**	**3.8E-03**	na	--
PCB-1016	0	--	1.4E-02	na	--	--	1.6E-02	na	--	--	3.5E-03	na	--	--	4.1E-03	na	--	--	**4.1E-03**	na	--
PCB-1221	0	--	1.4E-02	na	--	--	1.6E-02	na	--	--	3.5E-03	na	--	--	4.1E-03	na	--	--	**4.1E-03**	na	--
PCB-1232	0	--	1.4E-02	na	--	--	1.6E-02	na	--	--	3.5E-03	na	--	--	4.1E-03	na	--	--	**4.1E-03**	na	--
PCB-1242	0	--	1.4E-02	na	--	--	1.6E-02	na	--	--	3.5E-03	na	--	--	4.1E-03	na	--	--	**4.1E-03**	na	--
PCB-1248	0	--	1.4E-02	na	--	--	1.6E-02	na	--	--	3.5E-03	na	--	--	4.1E-03	na	--	--	**4.1E-03**	na	--
PCB-1254	0	--	1.4E-02	na	--	--	1.6E-02	na	--	--	3.5E-03	na	--	--	4.1E-03	na	--	--	**4.1E-03**	na	--
PCB-1260	0	--	1.4E-02	na	--	--	1.6E-02	na	--	--	3.5E-03	na	--	--	4.1E-03	na	--	--	**4.1E-03**	na	--
PCB Total[C]	0	--	--	na	1.7E-03	--	--	na	1.7E-03	--	--	na	1.7E-04	--	--	na	1.7E-04	--	--	na	**1.7E-04**

Attachment 5E

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Pentachlorophenol [C]	0	1.0E+01	6.1E+00	na	8.2E+01	1.1E+01	7.2E+00	na	8.2E+01	2.5E+00	1.5E+00	na	8.2E+00	2.8E+00	1.8E+00	na	8.2E+00	**2.8E+00**	**1.8E+00**	**na**	**8.2E+00**
Phenol	0	--	--	na	4.6E+06	--	--	na	4.6E+06	--	--	na	4.6E+05	--	--	na	4.6E+05	--	--	**na**	**4.6E+05**
Pyrene	0	--	--	na	1.1E+04	--	--	na	1.1E+04	--	--	na	1.1E+03	--	--	na	1.1E+03	--	--	**na**	**1.1E+03**
Radionuclides (pCi/l except Beta/Photon)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	**na**	--
Gross Alpha Activity	0	--	--	na	1.5E+01	--	--	na	1.5E+01	--	--	na	1.5E+00	--	--	na	1.5E+00	--	--	**na**	**1.5E+00**
Beta and Photon Activity (mrem/yr)	0	--	--	na	4.0E+00	--	--	na	4.0E+00	--	--	na	4.0E-01	--	--	na	4.0E-01	--	--	**na**	**4.0E-01**
Strontium-90	0	--	--	na	8.0E+00	--	--	na	8.0E+00	--	--	na	8.0E-01	--	--	na	8.0E-01	--	--	**na**	**8.0E-01**
Tritium	0	--	--	na	2.0E+04	--	--	na	2.0E+04	--	--	na	2.0E+03	--	--	na	2.0E+03	--	--	**na**	**2.0E+03**
Selenium	0	2.0E+01	5.0E+00	na	1.1E+04	2.2E+01	5.8E+00	na	1.1E+04	5.0E+00	1.3E+00	na	1.1E+03	5.4E+00	1.5E+00	na	1.1E+03	**5.4E+00**	**1.5E+00**	**na**	**1.1E+03**
Silver	0	3.2E-01	--	na	--	3.4E-01	--	na	--	7.9E-02	--	na	--	8.6E-02	--	na	--	**8.6E-02**	--	**na**	--
Sulfate	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	**na**	--
1,1,2,2-Tetrachloroethane [C]	0	--	--	na	1.1E+02	--	--	na	1.1E+02	--	--	na	1.1E+01	--	--	na	1.1E+01	--	--	**na**	**1.1E+01**
Tetrachloroethylene [C]	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	na	8.9E+00	--	--	na	8.9E+00	--	--	**na**	**8.9E+00**
Thallium	0	--	--	na	6.3E+00	--	--	na	6.3E+00	--	--	na	6.3E-01	--	--	na	6.3E-01	--	--	**na**	**6.3E-01**
Toluene	0	--	--	na	2.0E+05	--	--	na	2.0E+05	--	--	na	2.0E+04	--	--	na	2.0E+04	--	--	**na**	**2.0E+04**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	**na**	--
Toxaphene [C]	0	7.3E-01	2.0E-04	na	7.5E-03	7.9E-01	2.3E-04	na	7.5E-03	1.8E-01	5.0E-05	na	7.5E-04	2.0E-01	5.8E-05	na	7.5E-04	**2.0E-01**	**5.8E-05**	**na**	**7.5E-04**
Tributyltin	0	4.6E-01	6.3E-02	na	--	5.0E-01	7.4E-02	na	--	1.2E-01	1.6E-02	na	--	1.2E-01	1.8E-02	na	--	**1.2E-01**	**1.8E-02**	**na**	--
1,2,4-Trichlorobenzene	0	--	--	na	9.4E+02	--	--	na	9.4E+02	--	--	na	9.4E+01	--	--	na	9.4E+01	--	--	**na**	**9.4E+01**
1,1,2-Trichloroethane [C]	0	--	--	na	4.2E+02	--	--	na	4.2E+02	--	--	na	4.2E+01	--	--	na	4.2E+01	--	--	**na**	**4.2E+01**
Trichloroethylene [C]	0	--	--	na	8.1E+02	--	--	na	8.1E+02	--	--	na	8.1E+01	--	--	na	8.1E+01	--	--	**na**	**8.1E+01**
2,4,6-Trichlorophenol [C]	0	--	--	na	6.5E+01	--	--	na	6.5E+01	--	--	na	6.5E+00	--	--	na	6.5E+00	--	--	**na**	**6.5E+00**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	na	--	--	--	na	--	--	--	**na**	--
Vinyl Chloride [C]	0	--	--	na	6.1E+01	--	--	na	6.1E+01	--	--	na	6.1E+00	--	--	na	6.1E+00	--	--	**na**	**6.1E+00**
Zinc	0	3.6E+01	3.6E+01	na	6.9E+04	3.9E+01	4.3E+01	na	6.9E+04	9.1E+00	9.1E+00	na	6.9E+03	9.8E+00	1.1E+01	na	6.9E+03	**9.8E+00**	**1.1E+01**	**na**	**6.9E+03**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens, Harmonic Mean for Carcinogens, and Annual Average for Dioxin. Mixing ratios may be substituted for stream flows where appropriate.

Metal	Target Value (SSTV)
Antimony	4.3E+02
Arsenic	2.6E+01
Barium	na
Cadmium	6.7E-02
Chromium III	4.2E+00
Chromium VI	1.7E+00
Copper	3.9E-01
Iron	na
Lead	4.0E-01
Manganese	na
Mercury	5.1E-03
Nickel	1.1E+00
Selenium	8.8E-01
Silver	3.4E-02
Zinc	3.9E+00

Note: do not use QL's lower than the minimum QL's provided in agency guidance

Attachment 5F- STATS.exe Output Data

Facility = VA0061379 VDOT I-85
Chemical = Ammonia - Annual
Chronic averaging period = 30
WLAa = 3.2
WLAc = 0.65
Q.L. = 0.2
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 1.3114855607206
Average Weekly limit = 1.3114855607206
Average Monthly LImit = 1.3114855607206

The data are:

9

Facility = VA0061379 VDOT I-85
Chemical = Ammonia - Winter
Chronic averaging period = 30
WLAa = 3.2
WLAc = 1.3
Q.L. = 0.2
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 2.6229711214412
Average Weekly limit = 2.6229711214412
Average Monthly LImit = 2.6229711214412

The data are:

9

Attachment 5F
VA0061379 – STATS.exe Output

4/16/2008 10:17:21 AM

Facility = VA0061379 - VDOT I-85 Brunswick Rest
Chemical = TRC
Chronic averaging period = 4
WLAa = 0.0051
WLAc = 0.0032
Q.L. = 0.10
# samples/mo. = 30
# samples/wk. = 7

Summary of Statistics:

observations = 1
Expected Value = 20
Variance = 144
C.V. = 0.6
97th percentile daily values = 48.6683
97th percentile 4 day average = 33.2758
97th percentile 30 day average= 24.1210
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 4.68023930897034E-03
Average Weekly limit = 2.85825587531232E-03
Average Monthly LImit = 2.31962565349114E-03

The data are:

20

Attachment 6 – Reduced Monitoring Frequencies Evaluation

Reduced Monitoring Frequencies:
Permittees having exemplary operations that consistently meet permit requirements are considered for reduced monitoring per the VPDES Permit Manual and in accordance with EPA's "Interim Guidance for Performance-Based Reduction of NPDES Permit Monitoring Frequencies" (EPA 833-B-96-001). In order to determine if the permittee qualifies for reduced monitoring frequencies, the three year composite average concentration is calculated for Outfall 001 for most parameters based on the DMR data in Attachment 5C. All concentration data below QL was treated as zero for purposes of determining reduced monitoring eligibility. The composite average is compared to the permit limitation to calculate a ratio of the average to limitation. Using the ratio and the baseline monitoring frequency as determined in the Sampling Schedule Table in the VPDES Manual Section MN-2 A.3, reductions in monitoring frequencies are determined by the Reduction Monitoring Frequency table in VPDES Manual Section MN-2 A.6.b.

Parameter	3-yr Average Concentration (mg/L)	Permit Limitation (mg/L)	Ratio of Average to Limitation	Baseline Monitoring Frequency[1]	Eligible Reduction in Monitoring Frequency
BOD_5	3.97	20	0.20	Once per Month	Once per 6 months
TSS	8.40	30	0.28	Once per Month	Once per quarter

Ammonia: The facility is not eligible for reduced monitoring frequency for ammonia because of the change in the defined months for summer and winter for the ammonia limitations. The facility has not yet demonstrated the ability to meet the ammonia limitations with the shifted seasonal months. Reduced monitoring frequency eligibility will be re-evaluated during the next permit re-issuance.

Dissolved Oxygen: Passive post-aeration systems, such as cascade steps, are eligible for the reduction of monitoring frequencies on a case-by-case basis. This facility has active diffused aeration consisting of a set of blowers that provide the air for the diffusers. Therefore, the facility is not eligible for reduced monitoring frequency for dissolved oxygen.

pH: In order to qualify for reduced pH monitoring, the pH can not be directly adjusted by chemical addition. Reduced monitoring is also not allowed where the minimum or maximum pH fall within 0.5 units of the permit limits. The facility does not directly adjust pH by chemical addition. The maximum pH limitation for the facility is 9.0 S.U. On eight occasions over the last three years, the pH measured was 8.5 S.U. Therefore, the facility does not quality for reduced monitoring of pH.

Discussion: The monitoring frequency for TSS is eligible for reductions from once per month to once per quarter. The monitoring frequency for BOD_5 is eligible for reductions from once per month to once per six months. The permit requires the return to the baseline monitoring if the permittee fails to maintain the performance levels that are used to grant these reductions.

[1] Baseline Monitoring Frequency is the level of monitoring in the existing permit.
[2] TRC was not evaluated for reduced monitoring frequency. To ensure protection of aquatic life and human health, disinfection and dechlorination parameters are not eligible for reduced monitoring.

Attachment 7 – Site Visit Memorandum

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office

4949-A Cox Road, Glen Allen, Virginia 23060-6295 804/527-5020

TO: File
FROM: Jaime Bauer, Water Permit Writer
DATE: May 7, 2008
SUBJECT: Site Visit VA0061379 – VDOT I-85 Brunswick Rest Area
Cc: Charlie Stitzer, Water Compliance Inspector
Jennifer Palmore, Water Quality Planner

On Tuesday May 6, 2008, Jennifer Palmore and I met with site operator Mr. Jeff Swenson and VDOT consultant Mital Patel, Timmons Group at the I-85 Brunswick Rest Area located at mile marker 31 on the northbound side of I-85. The VPDES permit for this facility will expire on October 19, 2008. Mr. Swenson provided us with a tour of the plant. All equipment appeared to be in working and order, and no problems were observed. The lagoon pond was algae-free and no duck weed appeared around its banks.

We then walked with Mr. Swenson to the outfall location, located east of the plant. The plant discharges to an unnamed tributary of Sturgeon Creek. Little to no flow was observed from the outfall pipe. The water level in the creek appeared to be about 2 feet deep and the creek width at the outfall location was approximately 4 feet. The creek water appeared tea colored which is typical for waters of the Chowan basin. No algae or other problems were observed at the outfall location.

There was no sampling performed or review of onsite records.

Attachment 8 – Stream Monitoring Data Analysis – Sturgeon Creek, UT

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office

4949-A Cox Road, Glen Allen, VA 23060-6296 804/527-5020

SUBJECT: Stream Monitoring Data Analysis – Sturgeon Creek, UT
VDOT I-85 Rest Area discharge (VA0061379)

TO: Jaime Bauer

FROM: Jennifer Palmore, P.G.

DATE: April 23, 2008

COPIES: Curt Linderman, Mark Alling, Model File

A request for analysis of stream monitoring data for an unnamed tributary of Sturgeon Creek was received on March 14, 2008. The monitoring was conducted by the Virginia Department of Transportation to evaluate the effect of the I-85 Brunswick Rest Area discharge. The permittee has submitted instream monitoring results taken monthly during the period January 2004 through January 2008.

Background

The rest area discharge was originally modeled by Drun-sun Lee on October 17, 1975 using the Monroe Model. The modeler applied the DEQ's antidegradation policy and allowed a maximum 0.2 mg/L drop in dissolved oxygen. The following effluent limits were recommended and are still in effect:

Flow	36,000 gpd
BOD_5	20 mg/L
Total Suspended Solids	20 mg/L
Dissolved Oxygen	6.5 mg/L minimum

However, the model used a background 7Q10 low flow of 1.0 cfs in determining the limits. During the 2003 permit reissuance, it was determined that background low flow has since been considered to be much less than 1.0 cfs. A 7Q10 of 0 cfs was used in the 2003 reissuance and the current analysis determines a 7Q10 flow of 0.010 cfs (J. Palmore memo dated 3/18/2008). Due to the discrepancy between the model and subsequent flow frequency determinations, the 2003 permit included a special condition requiring the facility to perform instream water quality monitoring on the unnamed tributary to Sturgeon Creek.

The permittee submitted the monitoring plan for review on December 17, 2003. The plan was approved by DEQ water planning staff (O. Shehab memo dated 2/27/2004). The stations are located at the following:

Station #1 – 100 feet upstream of the outfall
Station #2 – 3513 feet / 0.66 miles downstream of the outfall at the Rt. 642 bridge
Station #3 – 10213 feet / 1.95 miles downstream of the outfall at the Rt. 606 bridge in Rocky Ford

Results

The results of the monitoring program have been plotted and analyzed using a paired two-sample Student's T-test to determine if the means of the upstream and downstream stations are equal. Refer to the attached analyses.

All upstream biochemical oxygen demand (BOD_5) values were at or below the quantification limit of 5.0 mg/L. The downstream stations were at or below 5.0 mg/L except on one occasion in October 2007 when the BOD_5 was 6 mg/L at Station #2 and 8 mg/L at Station #3.

All pH values upstream and downstream of the discharge were within the Water Quality Standard of 6.0-9.0 SU. A Student's paired T-test indicates that the downstream stations have a statistically significant higher mean than the upstream station. However, most values ranged from 6.0 to 7.0 SU, so the higher values would be closer to a neutral pH and would therefore not be of concern.

There were no violations of the maximum temperature Water Quality Standard of 32°C at any station. However, there were two dates in September 2004 where the temperature at Station #2 was more than 3°C higher than the upstream background station, which is a violation of the water quality standards. The mean temperature was also deemed statistically higher than the upstream station (mean of 14.6 versus 14.9). Station #3 was not analyzed for the temperature increase because any temperature effect on the stream would be maximized at the outfall and would not be expected to have an increasing influence downstream.

Station #2 has a higher dissolved oxygen level than the upstream station as indicated by the Student's T-test. There were no violations of the dissolved oxygen water quality standard at Station #2, which would imply that the facility does not have an adverse impact on dissolved oxygen at that location. However, there were two dates when the dissolved oxygen percent saturation exceeded 125% even though the upstream station was within the appropriate range (although elevated) - 140% in April 2005, and 131% in March 2006. Supersaturation can be an indicator of nutrient overenrichment causing algal growth. On both occasions, dissolved oxygen at Station #2 was approximately 14 mg/L.

The mean dissolved oxygen at station #3 is not statistically different than the upstream station. Although there were several days when the dissolved oxygen at Station #3 violated the 4.0 mg/L instantaneous minimum dissolved oxygen violation standard, the majority of those days the stream was either below the 7Q10 and the water quality standard did not apply, or the upstream station was also in violation. However, there appears to be one date of concern; in November 2006, the dissolved oxygen at Station #3 was only 3.98 mg/L (35% saturation), even though Stations #1 and #2 had dissolved oxygen values of 9.06 and 9.81 mg/L, respectively (81% and 87% saturation). The maximum effluent flow during the study period was in November 2006 (0.0251 MGD), which was in the same month as the low dissolved oxygen reading, however the BOD_5 was <QL for the same month.

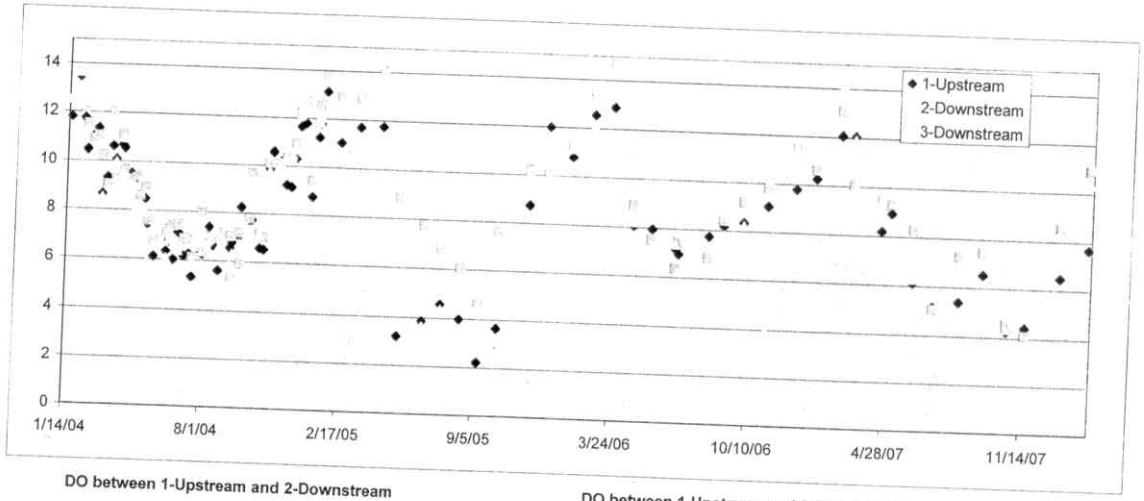
Recommendations

The monitoring confirmed that the tributary experiences occasional violations of the dissolved oxygen standard during low flow summer months, however the violations were <10% of the samples and the stream would not be considered impaired. There are multiple dates where there is a greater than 0.2 mg/L drop in dissolved oxygen from the upstream station; however, many of these samples were taken during months where the DMR states that the BOD_5 in the discharge was <QL; therefore it is not possible to positively determine that the drop is caused by the discharge. In fact, as stated above, the mean dissolved oxygen is actually higher at Station #2 than at the upstream station.

Based on review of the data, I do not believe that the facility caused an obvious negative impact on the receiving stream during the study period. However, it is difficult to extrapolate between the study period (during which the STP released a high-quality effluent that averaged a DO of 8.26 mg/L and a BOD_5 <QL at an average flow of only 0.00767 MGD) and the worst-case situation of low flow 7Q10 stream conditions and discharge at maximum effluent limit and full design flow. However, I do not recommend re-modeling the discharge at this time and the instream monitoring program may be discontinued.

If you have any questions or need any additional information, please do not hesitate to contact me.

DATE	1- Upstream DO - mg/L	2- Downstream DO - mg/L	3-Downstream DO - mg/L
1/18/04	11.79	12.49	12.52
1/29/04	13.44	13.61	14.34
2/7/04	11.75	12.15	12.41
2/12/04	10.47	11.54	13.05
2/21/04	11.05	10.92	12.23
2/27/04	11.35	11.05	12.2
3/6/04	8.64	10.23	8.51
3/13/04	9.34	9.05	8.33
3/20/04	10.61	11.99	11.05
3/25/04	10.1	9.25	10.01
4/3/04	10.67	11.1	9.44
4/6/04	10.55	9.65	10.95
4/17/04	9.51	9.29	8.44
4/24/04	9.31	9.37	8.1
5/1/04	8.6	8.58	8.01
5/8/04	8.47	8.92	7.92
5/12/04	7.45	7.58	5.89
5/22/04	6.12	6.72	8.23
6/9/04	6.35	7.04	6.07
6/13/04	6.78	7.24	6.82
6/20/04	6.01	7.38	6.87
6/27/04	7.12	7.42	6.37
7/5/04	6.16	6.9	5.78
7/12/04	6.26	6.81	5.72
7/17/04	5.32	6.13	5.93
7/31/04	6.34	7.96	5.13
8/1/04	6.25	6.34	7.19
8/11/04	7.39	6.97	5.46
8/21/04	6.53	6.94	7.31
8/25/04	5.61	7.15	6.52
9/11/04	6.56	7.02	5.82
9/14/04	6.77	5.36	6.32
9/24/04	7.06	7.18	6.74
9/26/04	8.25	5.89	6.42
10/9/04	7.72	7.78	8.54
10/12/04	7.73	9.64	8.62
10/24/04	6.58	7.17	7.13
10/30/04	6.53	7	7.48
11/5/04	9.88	10.1	9.77
11/10/04	10.59	10.09	9.25
11/21/04	10.21	10.15	9.82
11/30/04	9.23	10.35	10.35
12/7/04	9.14	10.3	10.35
12/13/04	10.33	10.93	10.82
12/19/04	11.66	12.29	12.13
12/26/04	11.79	12.68	12.43
1/7/05	8.76	9.43	10.6
1/15/05	11.23	11.82	11.92



DO between 1-Upstream and 2-Downstream

t-Test: Paired Two Sample for Means

	Variable 1	*Variable 2*
Mean	8.4	9.1
Variance	6.8	6.0
Observations	86	86
Pearson Correlation	0.882	
Hypothesized Mean Difference	0	
df	85	
t Stat	-5.359	
P(T<=t) one-tail	3.523E-07	
t Critical one-tail	1.663	
P(T<=t) two-tail	7.047E-07	
t Critical two-tail	1.988	

t_{stat}=-5.359<-1.663 & 1.663 so reject H_0 that means are equal

P(T<=t) is statistically significant (3.523E-07<<0.05)

DO between 1-Upstream and 3-Downstream

t-Test: Paired Two Sample for Means

	Variable 1	*Variable 2*
Mean	8.4	8.5
Variance	6.8	7.5
Observations	86	86
Pearson Correlation	0.883	
Hypothesized Mean Difference	0	
df	85	
t Stat	-0.900	
P(T<=t) one-tail	0.185	
t Critical one-tail	1.663	
P(T<=t) two-tail	0.371	
t Critical two-tail	1.988	

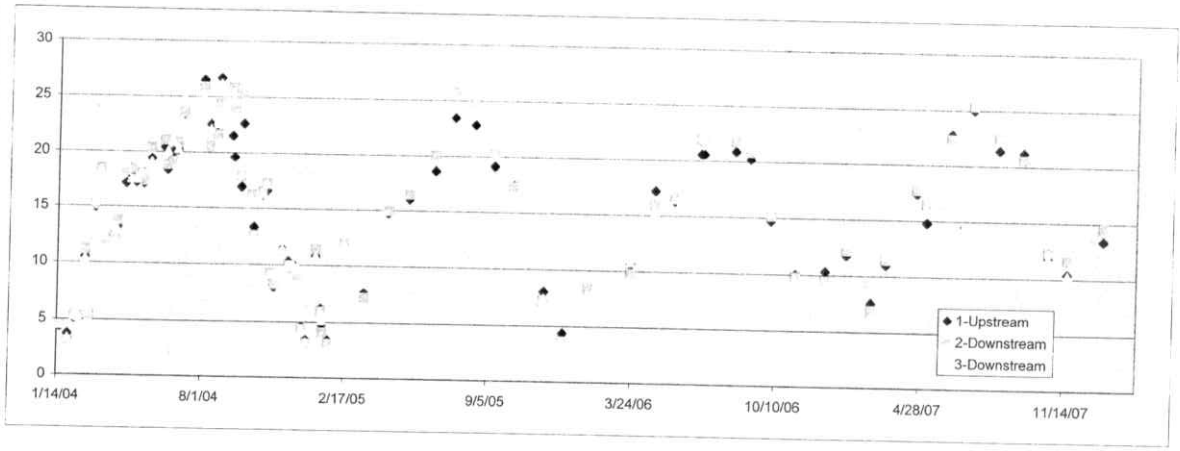
t_{stat}=-0.900<1.663 & >-1.663 so cannot reject H_0 that means are equal

P(T<=t) is not statistically significant (0.185>0.05)

However, the t-value is positive if the first mean is larger than the second and negative if it is smaller, therefore the upstream site has a lower DO mean than the two downstream sites, as shown in "Variable 2 mean".

DATE	1- Upstream DO - mg/L	2- Downstream DO - mg/L	3-Downstream DO - mg/L	
1/17/05	11.79	12.53	12.1	
1/25/05	13.12	13.79	14.29	
2/16/05	11.04	12.94	12.64	
3/16/05	11.69	12.86	10.59	
4/18/05	11.75	14.06	10.93	
5/17/05	[illegible]	8.85	6.35	
6/22/05	[illegible]	7.78	[illegible]	
7/19/05	4.57	6.8	4.35	
8/16/05	[illegible]	6.05	4.87	
9/13/05	[illegible]	4.61	4.61	Several periods of low flow, but not <7Q10 on
10/10/05	[illegible]	7.61	4.69	specific days in questions
11/23/05	8.73	10.22	10.13	
12/20/05	11.99	10.08	10.04	
1/23/06	10.79	11.2	11.15	
2/23/06	12.54	13.42	12.1	
3/23/06	12.88	14.72	10.4	
4/25/06	8.07	8.93	8.22	
5/22/06	7.95	7.52	6.37	
6/27/06	7.15	6.38	7.37	
7/1/06	6.96	7.47	6.22	
8/14/06	7.74	6.85	8.76	
9/4/06	8.19	8.4	7.83	
10/3/06	8.35	9.19	8.23	
11/7/06	9.06	9.81	[illegible]	
12/18/06	9.8	11.5	11.45	
1/16/07	10.26	10.61	9.44	
2/20/07	12.06	13.08	14.14	
3/12/07	12.04	10.04	11.92	
4/23/07	8.21	9.47	9.52	
5/7/07	8.94	9.3	8.49	
6/9/07	6.12	8.3	6.28	
7/9/07	5.18	5.09	4.48	
8/15/07	5.41	7.28	6.59	
9/18/07	6.54	7.46	[illegible]	<7Q10
10/24/07	4.26	4.54	4.37	Period of very low flow, but above 7Q10 on 10/23 to 11/4
11/20/07	4.42	4.11	5.78	<7Q10
1/8/08	6.48	8.57	7.14	
2/18/08	7.68	10.94	10.36	

DATE	1-Upstream Temp	2-Downstream Temp	3-Downstream Temp
1/18/04	4.3	4.5	4.5
1/29/04	3.7	3.1	3.3
2/7/04	5.1	5.3	5.4
2/12/04	5.2	5.2	5.4
2/21/04	10.5	11.11	10.4
2/27/04	5.3	5.3	5.7
3/6/04	14.9	15.1	15.5
3/13/04	18.3	18.4	18.3
3/20/04	12	12	12.4
4/3/04	12.8	12.5	13.2
4/6/04	13.2	13.7	12.9
4/17/04	17.1	18.2	18.9
4/24/04	17.8	18.4	17.5
5/1/04	17.2	17.5	17.5
5/8/04	17.5	18	18.2
5/12/04	17.1	17.3	19.4
5/22/04	19.4	20.3	19.1
6/9/04	20.4	21	21.3
6/13/04	18.4	18.8	20.1
6/20/04	20	19.2	20.9
6/27/04	20.2	20.8	20.3
7/5/04	23.4	23.5	25
8/1/04	26.5	25.9	24.9
8/11/04	22.5	20.5	22.1
8/21/04	21.7	21.6	22.8
8/25/04	26.7	24.3	26.2
9/11/04	21.5	23	24.8
9/14/04	19.6	23	24.6
9/24/04	16.9	17.8	18.1
9/26/04	22.6	25.2	26.1
10/9/04	16	16.2	15.7
10/12/04	13.3	12.6	12.6
10/24/04	16.2	16.5	16.3
10/30/04	16.6	17.2	17.2
11/5/04	9	9.2	9.1
11/10/04	8	8.2	9.1
11/21/04	11.4	11.1	11.4
11/30/04	10.3	10	10
12/7/04	10	9.7	10
12/13/04	9.4	9	9.7
12/19/04	4.6	4.4	4.3
12/26/04	3.4	3.1	3.2
1/7/05	10.8	11.4	10.8
1/15/05	6.2	6	5.9
1/17/05	4.8	4.1	5.2



Temp between 1-Upstream and 2-Downstream

t-Test: Paired Two Sample for Means

	Variable 1	*Variable 2*
Mean	14.6	14.9
Variance	38.3	43.1
Observations	80	80
Pearson Correlation	0.989	
Hypothesized Mean Difference	0	
df	79	
t Stat	-2.452	
P(T<=t) one-tail	0.008	
t Critical one-tail	1.664	
P(T<=t) two-tail	0.016	
t Critical two-tail	1.990	

t_{stat}=-2.452<-1.664 & 1.664 so reject H_0 that means are equal
P(T<=t) is statistically significant (0.008<0.05)

Temp between 1-Upstream and 3-Downstream

t-Test: Paired Two Sample for Means

	Variable 1	*Variable 2*
Mean	14.6	15.5
Variance	38.3	50.5
Observations	80	80
Pearson Correlation	0.979	
Hypothesized Mean Difference	0	
df	79	
t Stat	-4.691	
P(T<=t) one-tail	5.597E-06	
t Critical one-tail	1.664	
P(T<=t) two-tail	1.119E-05	
t Critical two-tail	1.990	

t_{stat}=-4.691<-1.664 & 1.664 so reject H_0 that means are equal
P(T<=t) is statistically significant (5.597E-06<<0.05)

Temperature is statistically higher at both downstream locations. No maximum temperature WQS violations. Two days at 2-Downstream show water temperature is elevated more than 3 degrees C above background, however the mean is elevated less than 3 deg C.

DATE	1-Upstream Temp	2-Downstream Temp	3-Downstream Temp	
1/25/05	3.4	3.1	2.3	
2/16/05	11.9	11.9	11.9	
3/16/05	7.6	7.2	8.4	
4/18/05	14.7	14.9	15.9	
5/17/05	16	16.4	16.7	
6/22/05	18.6	20	20.3	
7/19/05	23.4	25.7	26.2	
8/16/05	22.8	24.6	27.4	
9/13/05	19.1	20.2	20.1	Several periods of low flow, but not <7Q10 on
10/10/05	17.4	17.3	18.7	specific days in questions
11/23/05	8	7.3	7.4	
12/20/05	4.4	3.7	3.6	
1/23/06	8.3	8.3	7.7	
3/23/06	10.6	9.8	10.8	
4/25/06	17.2	15.9	15.4	
5/22/06	16.3	16.5	16.5	
6/27/06	20.6	21.9	22.2	
7/1/06	20.6	21.7	23.3	
8/14/06	20.9	21.7	23.1	
9/4/06	20.2	20.8	21.4	
10/3/06	14.7	15.1	15.4	
11/7/06	10	9.8	9.6	
12/18/06	10.3	9.5	8.6	
1/16/07	11.8	12.2	12.9	
2/20/07	7.6	7	6.2	
3/12/07	11	11.4	11.9	
4/23/07	17.4	17.7	19	
5/7/07	14.8	16.4	16.1	
6/9/07	22.8	22.4	24.7	
7/9/07	25	25.3	27	
8/15/07	21.4	22.5	27.4	
9/18/07	21.2	20.6	22.8	<7Q10
10/24/07	11.9	12.3	11.8	Period of very low flow, but above 7Q10 on 10/23 to 11/4
11/20/07	10.4	11.6	10.3	<7Q10
1/8/08	13.4	14.6	13.6	

3/25/04	14.4		
7/12/04	22.5	22.8	
7/17/04	25.2		25.4
7/31/04	26.9	27.6	
2/18/08	13.4	14.6	

90th %ile	**22.7**	**23.8**	**24.9**

DATE	1-Upstream %Saturation	2-Downstream %Saturation	3-Downstream %Saturation
1/18/04	92	98	98
1/29/04	103	102	108
2/7/04	93	97	99
2/12/04	83	92	104
2/21/04	100	100	110
2/27/04	91	88	98
3/6/04	86	103	86
3/13/04	100	97	89
3/20/04	99	112	104
3/25/04	100		
4/3/04	102	105	91
4/6/04	102	94	105
4/17/04	100	99	92
4/24/04	99	101	85
5/1/04	90	91	85
5/8/04	89	95	85
5/12/04	78	80	65
5/22/04	67	75	90
6/9/04	71	80	72
6/13/04	73	78	76
6/20/04	67	81	78
6/27/04	79	84	71
7/5/04	73	82	71
7/12/04	73	80	
7/17/04	65		73
7/31/04	80	102	
8/1/04	79	79	88
8/11/04	86	78	63
8/21/04	75	80	86
8/25/04	71	86	81
9/11/04	75	87	71
9/14/04	75	64	77
9/24/04	74	76	72
9/26/04	96	72	80
10/9/04	79	80	87
10/12/04	75	92	82
10/24/04	68	74	73
10/30/04	68	73	78
11/5/04	86	89	86
11/10/04	90	86	81
11/21/04	94	93	91
11/30/04	83	93	93
12/7/04	82	91	93
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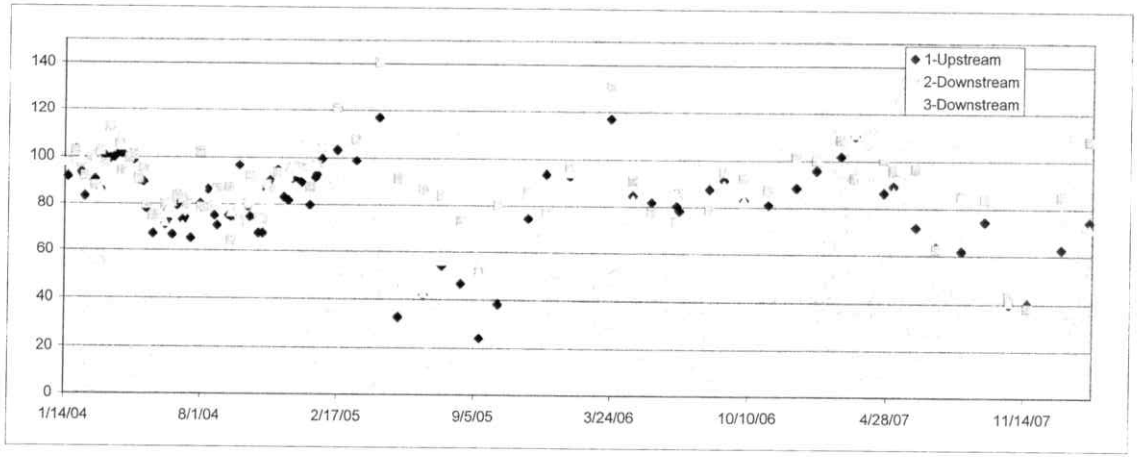
12/19/04	91	96	94
12/26/04	89	95	94
1/7/05	80	87	97



DO % Saturation between 1-Upstream and 2-Downstream

t-Test: Paired Two Sample for Means

	Variable 1	*Variable 2*
Mean	81	89
Variance	334	246
Observations	83	83
Pearson Correlation	0.720	
Hypothesized Mean Difference	0	
df	82	
t Stat	-5.468	
P(T<=t) one-tail	2.398E-07	
t Critical one-tail	1.664	
P(T<=t) two-tail	4.797E-07	
t Critical two-tail	1.989	

t_{stat}=-5.468<-1.664 & 1.664 so reject H_0 that means are equal

P(T<=t) is statistically significant (2.398E-07<<0.05)

DO % Saturation between 1-Upstream and 3-Downstream

t-Test: Paired Two Sample for Means

	Variable 1	*Variable 2*
Mean	81	83
Variance	340	316
Observations	82	82
Pearson Correlation	0.759	
Hypothesized Mean Difference	0	
df	81	
t Stat	-1.490	
P(T<=t) one-tail	0.070	
t Critical one-tail	1.664	
P(T<=t) two-tail	0.140	
t Critical two-tail	1.990	

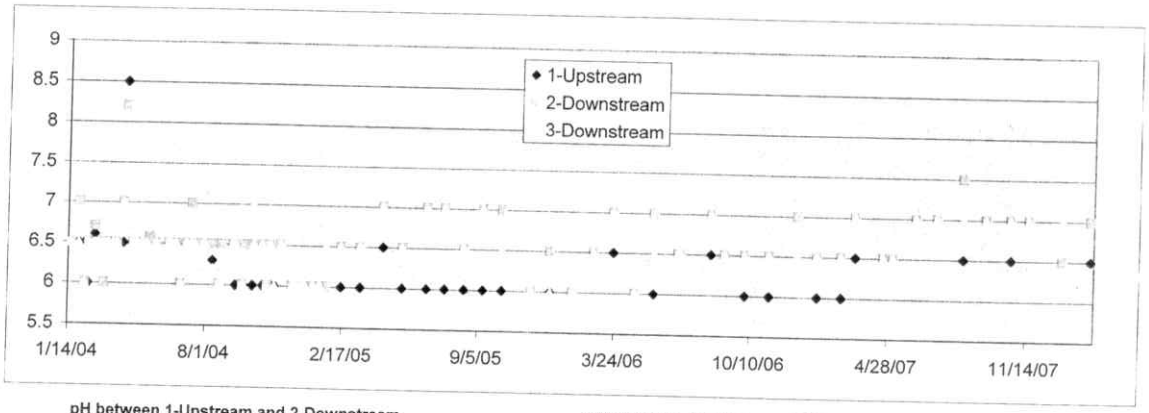
t_{stat}=-1.490<1.664 & >-1.664 so cannot reject H_0 that means are equal

P(T<=t) is not statistically significant (0.070>0.05)

The t-value is positive if the first mean is larger than the second and negative if it is smaller, therefore the upstream site has a lower DO mean than the two downstream sites, as shown in "Variable 2 mean".

DATE	1-Upstream %Saturation	2-Downstream %Saturation	3-Downstream %Saturation	
1/15/05	92	96	96	
1/17/05	93	97	96	
1/25/05	100	104	105	
2/16/05	103	121	118	
3/16/05	99	108	91	
4/18/05	117		112	
5/17/05		91	69	
6/22/05		86		
7/19/05		84		
8/16/05		73	62	
9/13/05				Several periods of low flow, but not <7Q10 on
10/10/05		80		specific days in questions
11/23/05	74	86	85	
12/20/05	93	77	77	
1/23/06	93	96	94	
2/23/06				
3/23/06	117		95	
4/25/06	85	91	83	
5/22/06	82	78	66	
6/27/06	80	74	85	
7/1/06	78	86	74	
8/14/06	88	79	103	
9/4/06	91	95	89	
10/3/06	83	92	83	
11/7/06	81	87		
12/18/06	88	102	99	
1/16/07	96	100	90	
2/20/07	102	109	115	
3/12/07	110	93	111	
4/23/07	87	100	104	
5/7/07	89	96	87	
6/9/07	72	97	76	
7/9/07	63	63		
8/15/07	62	85	84	
9/18/07	74	84		<7Q10
10/24/07				Period of very low flow, but above 7Q10 on 10/23 to 11/4
11/20/07				<7Q10
1/8/08	63	85	78	
2/18/08	74	109	72	

DATE	1-Upstream pH (S.U.)	2-Downstream pH (S.U.)	3-Downstream pH (S.U.)
1/18/04	6.5	6.5	6.5
1/29/04	6.5	7	6.5
2/7/04	6.5	6	6
2/12/04	6	6.5	6.5
2/21/04	6.6	6.7	6.5
2/27/04	6.5	6.5	6.5
3/6/04	6.5	6	6.5
3/13/04	6.5	6.5	6.5
3/20/04	6.5	6.5	6.5
3/25/04	6.5	6.5	6.5
4/3/04	6.5	7	7
4/6/04	8.5	8.2	8.1
4/17/04	6.5	6.5	6.5
4/24/04	6.5	6.5	6.5
5/1/04	6.5	6.5	6.5
5/8/04	6.5	6.5	6.5
5/12/04	6.5	6.6	6.7
5/22/04	6.5	6.5	6.5
6/9/04	6.5	6.5	6.5
6/13/04	6.5	6.5	6.5
6/20/04	6.5	6.5	6.5
6/27/04	6	6	6
7/5/04	6.5	6.5	6.5
7/12/04	6.5	7	6.5
7/17/04	6.5	6.5	6.5
7/31/04	6.5	6.5	6.5
8/1/04	6.5	6.5	6.5
8/11/04	6.3	6.5	6.2
8/21/04	6	6	6
8/25/04	6.5	6.5	6
9/11/04	6.5	6.5	6.5
9/14/04	6	6.5	6.5
9/24/04	6	6	6
9/26/04	6	6.5	6
10/9/04	6	6.5	7
10/12/04	6.5	6.5	6.5
10/24/04	6	6.5	6.5
10/30/04	6	6	6
11/5/04	6	6.5	6.5
11/10/04	6	6.5	6
11/21/04	6.5	6.5	6.5
12/7/04	6	6	6
12/13/04	6	6	6
12/19/04	6	6	6
12/26/04	6	6	6



pH between 1-Upstream and 2-Downstream

t-Test: Paired Two Sample for Means

	Variable 1	*Variable 2*
Mean	6.3	6.5
Variance	0.1	0.2
Observations	86	86
Pearson Correlation	0.633	
Hypothesized Mean Difference	0	
df	85	
t Stat	-5.738	
P(T<=t) one-tail	7.189E-08	
t Critical one-tail	1.663	
P(T<=t) two-tail	1.438E-07	
t Critical two-tail	1.988	

t_{stat}=-5.738<-1.663 & 1.663 so reject H_0 that means are equal
P(T<=t) is statistically significant (7.189E-08<<0.05)

pH between 1-Upstream and 3-Downstream

t-Test: Paired Two Sample for Means

	Variable 1	*Variable 2*
Mean	6.3	6.5
Variance	0.1	0.1
Observations	84	84
Pearson Correlation	0.638	
Hypothesized Mean Difference	0	
df	83	
t Stat	-4.632	
P(T<=t) one-tail	6.637E-06	
t Critical one-tail	1.663	
P(T<=t) two-tail	1.327E-05	
t Critical two-tail	1.989	

t_{stat}=-4.632<-1.663 & 1.663 so reject H_0 that means are equal
P(T<=t) is statistically significant (6.637E-06<<0.05)

However, the mean for the downstream sites is closer to a neutral pH of 7.0, therefore the effect of the discharge is not considered a negative impact on the stream.

DATE	1-Upstream pH (S.U.)	2-Downstream pH (S.U.)	3-Downstream pH (S.U.)	
1/7/05	6	6	6	
1/15/05	6	6	6	
1/17/05	6	6	6	
1/25/05	6	6	6.5	
2/16/05	6	6.5	6.5	
3/16/05	6	6.5	6.5	
4/18/05	6.5	7	7	
5/17/05	6	6.5	6.5	
6/22/05	6	7	7	
7/19/05	6	7	7	
8/16/05	6	6.5	6.5	
9/13/05	6	7	7	Several periods of low flow, but not <7Q10 on
10/10/05	6	7	6.5	specific days in questions
11/23/05	6	6	6	
12/20/05	6	6.5	6	
1/23/06	6	6	6	
2/23/06	6.5	6.5	6.5	
3/23/06	6.5	7	7	
4/25/06	6	6	6	
5/22/06	6	7	6.5	
6/27/06	6.5	6.5	6.5	
7/1/06	6.5	6.5	6.5	
8/14/06	6.5	7	7	
9/4/06	6.5	6.5	6.5	
10/3/06	6	6.5	6.5	
11/7/06	6	6.5	6.5	
12/18/06	7	7	6.5	
1/16/07	6	6.5	6.5	
2/20/07	6	6.5	6.5	
3/12/07	6.5	7	7	
4/23/07	6.5	6.5	6.5	
5/7/07	6.5	6.5	6.5	
6/9/07	7	7	7	
7/9/07	7	7	7	
8/15/07	6.5	7.5	7	
9/18/07	7	7	7	<7Q10
10/24/07	6.5	7	7	Period of very low flow, but above 7Q10 on 10/23 to 11/4
11/20/07	7	7	7	<7Q10
1/8/08	6.5	6.5	7	
2/18/08	6.5	7		
11/30/04	6	6		

Attachment 9 – Temperature Data and Evaluation

VA0061379 - VDOT In Stream Monitoring UT to Sturgeon Creek

ANNUAL DATA*

Year	Date	Temp
2005	7-Jan	11.4
2008	8-Jan	14.6
2005	15-Jan	6
2007	16-Jan	12.2
2005	17-Jan	4.1
2004	18-Jan	4.5
2006	23-Jan	8.3
2005	25-Jan	3.1
2004	29-Jan	3.1
2004	7-Feb	5.3
2004	12-Feb	5.2
2005	16-Feb	11.9
2008	18-Feb	14.6
2007	20-Feb	7
2004	21-Feb	11.11
2004	27-Feb	5.3
2004	6-Mar	15.1
2007	12-Mar	11.4
2004	13-Mar	18.4
2005	16-Mar	7.2
2004	20-Mar	12
2004	25-Mar	9.8
2004	3-Apr	12.5
2004	6-Apr	13.7
2004	17-Apr	18.2
2005	18-Apr	14.9
2007	23-Apr	17.7
2004	24-Apr	18.4
2006	25-Apr	15.9
2004	1-May	17.5
2007	7-May	16.4
2004	8-May	18
2004	12-May	17.3
2005	17-May	16.4
2004	22-May	20.3
2006	22-May	16.5
2004	9-Jun	21
2004	9-Jun	22.4
2004	13-Jun	18.8
2004	20-Jun	19.2
2005	22-Jun	20
2004	27-Jun	20.8
2006	27-Jun	21.9
2006	1-Jul	21.7
2004	5-Jul	23.5
2007	9-Jul	25.3
2004	12-Jul	22.8
2005	19-Jul	25.7
2004	31-Jul	27.6
2004	1-Aug	25.9
2004	11-Aug	20.5
2006	14-Aug	21.7
2007	15-Aug	22.5
2005	16-Aug	24.6
2004	21-Aug	21.6
2004	25-Aug	24.3
2006	4-Sep	20.8
2004	11-Sep	25.8
2005	13-Sep	20.2
2004	14-Sep	23.9
2007	18-Sep	20.6
2004	24-Sep	17.8
2004	26-Sep	25.2
2006	3-Oct	15.1
2004	9-Oct	16.2
2005	10-Oct	17.3
2004	12-Oct	12.6
2007	24-Oct	12.3
2004	24-Oct	16.5
2004	30-Oct	17.2
2004	5-Nov	9.2
2006	7-Nov	9.8
2004	10-Nov	8.2
2007	20-Nov	11.6
2004	21-Nov	11.1
2005	23-Nov	7.3
2004	30-Nov	10
2004	7-Dec	9.7
2004	13-Dec	9
2006	18-Dec	9.5
2004	19-Dec	4.4
2005	20-Dec	3.7
2004	26-Dec	3.1

Annual Avg:	16.29683333
90th Percentile Annual:	24.33

* Data collected monthly from January 2004 through February 2008.

VA0061379 - VDOT In Stream Monitoring UT to Sturgeon Creek

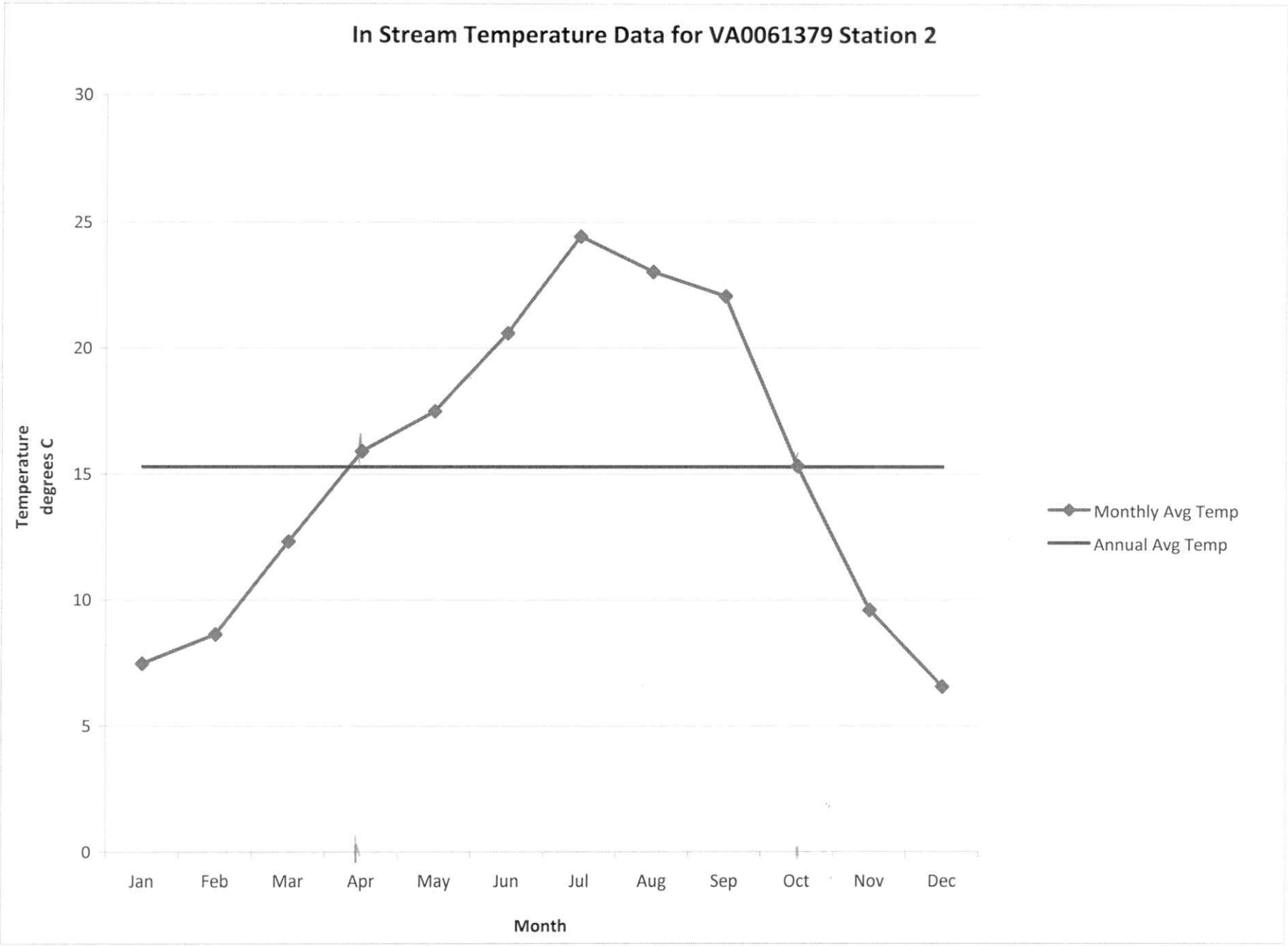
WINTER DATA*

Year	Date	Date
2005	7-Jan	11.4
2008	8-Jan	14.6
2005	15-Jan	6
2007	16-Jan	12.2
2005	17-Jan	4.1
2004	18-Jan	4.5
2006	23-Jan	8.3
2005	25-Jan	3.1
2004	29-Jan	3.1
2004	7-Feb	5.3
2004	12-Feb	5.2
2005	16-Feb	11.9
2008	18-Feb	14.6
2007	20-Feb	7
2004	21-Feb	11.11
2004	27-Feb	5.3
2004	6-Mar	15.1
2007	12-Mar	11.4
2004	13-Mar	18.4
2005	16-Mar	7.2
2004	20-Mar	12
2004	23-Mar	9.8
2006	3-Oct	15.1
2004	9-Oct	16.2
2005	10-Oct	17.3
2004	12-Oct	12.6
2007	24-Oct	12.3
2004	24-Oct	16.5
2004	30-Oct	17.2
2004	5-Nov	9.2
2006	7-Nov	9.8
2004	10-Nov	8.2
2007	20-Nov	11.6
2004	21-Nov	11.1
2005	23-Nov	7.3
2004	30-Nov	10
2004	7-Dec	9.7
2004	13-Dec	9
2006	18-Dec	9.5
2004	19-Dec	4.4
2005	20-Dec	3.7
2004	26-Dec	3.1
	90th Percentile Winter:	16.09

MONTHLY AVERAGES

Month	Monthly Avg Temp	Annual Avg Temp
Jan	7.477777778	15.28060847
Feb	8.63	15.28060847
Mar	12.31666667	15.28060847
Apr	15.9	15.28060847
May	17.48571429	15.28060847
Jun	20.58571429	15.28060847
Jul	24.43333333	15.28060847
Aug	23.01428571	15.28060847
Sep	22.675	15.28060847
Oct	15.31428571	15.28060847
Nov	9.6	15.28060847
Dec	6.566666667	15.28060847
Annual Avg	15.33328704	

* Data collected monthly from January 2004 through February 2008.


In Stream Temperature Data for VA0061379 Station 2
30
25
20
15
10
5
0
Temperature degrees C
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
Monthly Avg Temp
Annual Avg Temp